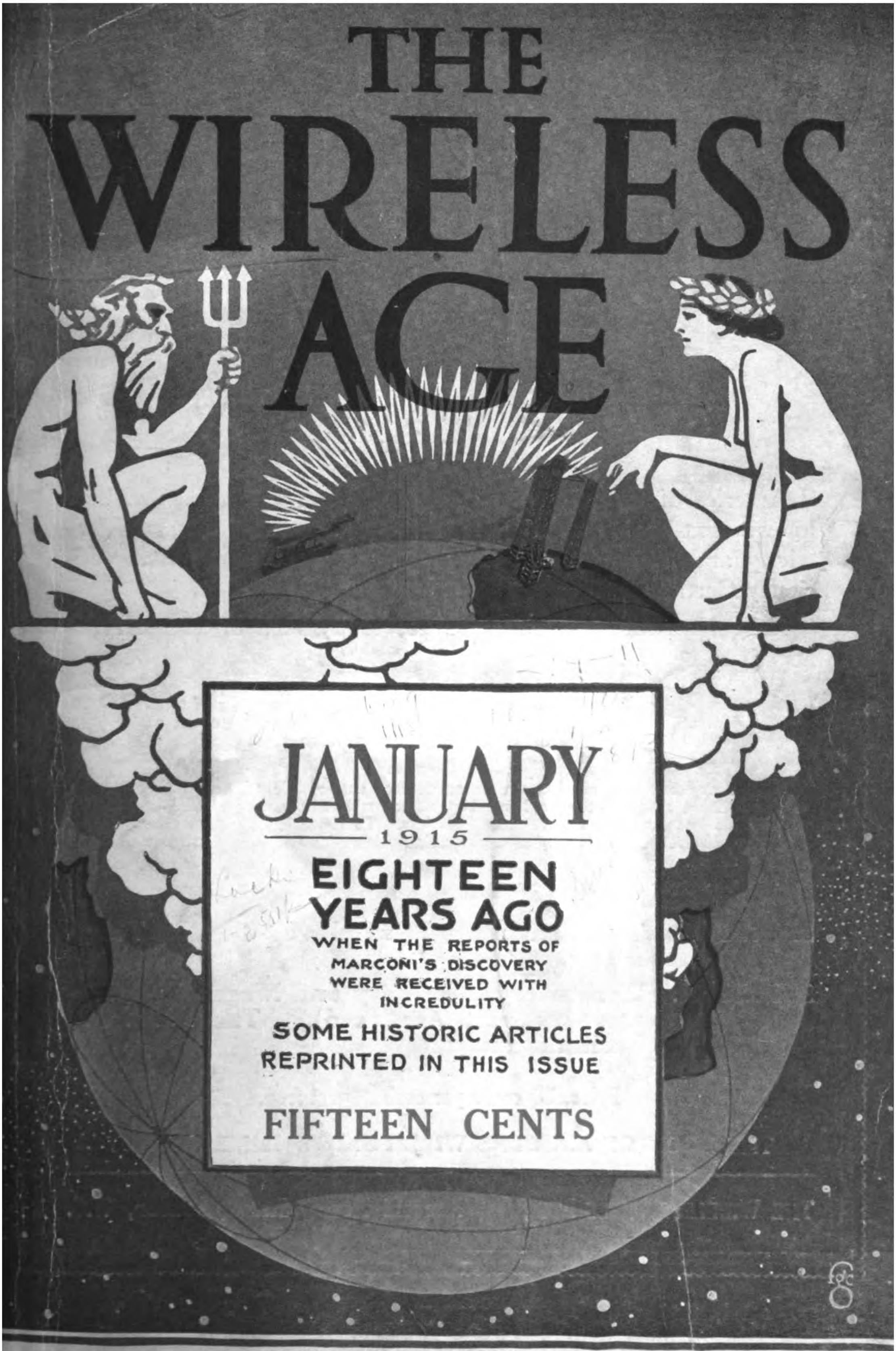
THE
WIRELESS
AGE
JANUARY
1915
EIGHTEEN
YEARS AGO
WHEN THE REPORTS OF
MARCONI'S DISCOVERY
WERE RECEIVED WITH
INCREDULITY
SOME HISTORIC ARTICLES
REPRINTED IN THIS ISSUE
FIFTEEN CENTS

THE WIRELESS AGE

An Illustrated Monthly Magazine of
RADIO COMMUNICATION

Incorporating the Marconigraph

J. ANDREW WHITE, Editor — WHEELER N. SOPER, Asst. Editor

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THE WIRELESS AGE

JANUARY, 1915

RISING TO AN EMERGENCY

HOW OPERATOR LOVEJOY DIRECTED WITH A FLASH-LAMP THE RESCUE WORK IN THE WRECK OF THE HANALEI

HOW Loren A. Lovejoy, Marconi wireless operator, showed himself to be the right man in the right place is related in the story of the wreck of the steam schooner Hanalei, which struck a reef opposite the transmitting station of the Marconi trans-Pacific service at Bolinas, Cal. Pounded by the seas until her wireless cabin was washed away and the apparatus placed out of commission, the vessel was broken up almost in the very shadow of the Bolinas towers. Darkness came on and communication with the shore was cut off; but the quick wit of Lovejoy found a way to overcome this difficulty and for many hours throughout the night he signalled the watchers on the beach by flash-light. Through his efforts the rescue work was considerably facilitated and the courage of those on the wreck strengthened.

Lovejoy, after a thrilling experience on a raft, was picked up and saved. His fellow operator on the Hanalei—Adolph John Svenson—was not so fortunate. Svenson sent out an S O S which summoned other vessels to the scene of the wreck and did all that was possible to prevent life loss. When the ship broke in pieces he was hurled into the sea and drowned.

The Marconi men ashore were not idle meanwhile. The flash-light signals of Lovejoy were answered by Manager Baxter of the Bolinas station, who sent messages of encouragement to the Hanalei's people. He and others from the station waded into the surf when the seas demolished the ship and snatched drowning folk from the waters. Bon fires were kindled on the beach to warm and cheer the sufferers and the Marconi Company's hotel was thrown open as a refuge.

There were sixty-three persons on the Hanalei when she grounded. Twenty of these perished and forty-three were saved.

The monotony in the voyage of the Hanalei was not disturbed by untoward happenings as she steamed along the coast on her way from Eureka, Cal., to San Francisco. On the morning of Monday, November 23, she was off Duxbury

reef, fifteen miles north of San Francisco and opposite Bolinas. Earlier in the day a light mist had blown in from the sea and as the morning wore on this thickened until it had become a dense fog. So dense was the haze that it was impossible to see a ship's length ahead and the Hanalei proceeded cautiously.

And then, almost before the lookout had voiced his shrill cry of "land ahead!" the reef loomed up. The next instant the ship was caught in the strong shoreward current and before she could be drawn away from the peril she had crashed on the rocks. This was at ten minutes to twelve o'clock.

At first the situation did not appear serious in the extreme. The Hanalei was equipped with Marconi wireless and the shore was only 900 feet away. But the waves were running high and the ship, nestled on the northern spur of the treacherous reef, pounded against the rocks until her timbers groaned.

The commander of the ship—Captain J. J. Carey—and his officers saw the danger and took measures to protect the Hanalei's people. Word was sent to the wireless room to send out the S O S and the call stretched forth over the brine until it had been picked up by ships for miles around.

Loren A. Lovejoy with Adolph Svenson as his assistant was in charge of the wireless. Lovejoy was in the wireless cabin when the Hanalei grated on the reef. He rendered what aid he could to the officers in calming the passengers and then hurried on to the wireless room, where in obedience to instructions from Captain Carey, he directed Svenson to send out a distress call. The signals were picked up by the Marconi station at San Francisco and the revenue cutter McCulloch as well as the Standard Oil steamships El Segundo and Richmond. The McCulloch was in San Francisco harbor and her commander hastened to the scene of the wreck. The Standard Oil craft altered their courses on receiving the appeal and steamed toward Bolinas. So not long after the wireless call was sent there was a small fleet of vessels hovering about the stranded craft.

They were of little aid at first. The Hanalei rested well up on the reef and the heavy seas made an approach to her extremely perilous. Time after time the McCulloch and the other craft circled about the ship. But they could steam only within a certain distance. The mariners knew too well the futility of attempting to accomplish a rescue with such hindrances as the swift shoreward current and the jagged rocks of Duxbury standing in the way. It would be foolhardy, they argued, to try to do so.

Meanwhile the plight of the Hanalei's people was becoming more grave every minute. Staunch as the vessel was, she could not withstand the terrific pounding she received. The great waves swept over her decks leaving devastation in their path. Within a short time after the S O S was sent the waters reached the engine room, cutting off the electric energy and placing the power set out of commission. Then the operators turned to the auxiliary radio apparatus. But this was not permitted to remain in operation long, for the waters found their way to the wireless cabin in great volume and placed that set out of commission also. But Lovejoy and Svenson succeeded in drying the apparatus so that it worked, notwithstanding the unfavorable conditions.

Almost from the time the Hanalei went on the rocks Lovejoy had been at the key. While the waters were threatening to sweep the wireless cabin away, he remained in it, keeping those on the shore and on the ships nearby informed regarding the situation on the wreck. At length the position of the operator became so fraught with danger that Pettingill, chief engineer of the Hanalei, insisted on remaining at the door of the wireless room prepared to help him to safety. It was well that he took this precaution, for after the cabin had withstood the seas for more than an hour it was wrenched loose from its supports and hurled over the side of the ship, carrying with it a part of the wireless apparatus. Just in time to prevent Lovejoy from being swept into the sea, Pettingill pulled him out of the cabin with one hand and caught hold of a stanchion with the other.

All during the afternoon the Hanalei

When dawn broke twenty-eight of those who were saved found their way to the beach. Some swam, others clung to wreckage and several were borne ashore unconscious. Manager Baxter and other men attached to the Marconi station at Bolinas risked their lives in the surf to aid in the work of rescue

was hidden from the view of those on the shore by the fog. From time to time attempts were made to send lines from the beach to the ship, but they were unsuccessful. Finally, at the suggestion of the men at the Marconi station, a mortar was sent by automobile from San Francisco. With this it was planned to shoot a line from the Bolinas cliffs to the wreck.

On the beach crowds of men and women, half crazed with fear and anxiety, waited for news from the Hanalei. Their anxiety became more acute when the wireless was silenced by the waters. Four boats, the wrecked wireless cabin and two life-rafts floated ashore and told them how perilous was the position of the stranded ship. Darkness set in with the hope of rescue as remote as ever.

It was then that Lovejoy, beset as he was on all sides by dangers, hit upon a happy means of establishing communication with the shore. By good fortune he secured a pocket flashlight, and with this he spelled out in Morse the story of the tragedy that was taking place on the rocking decks of the Hanalei. On the shore Manager Baxter received the tidings and flashed back words of comfort and encouragement.

"Hurry, hurry," was the message that came most frequently from Lovejoy. It spurred the rescuers on to renewed efforts and they kept the Hanalei's people informed by flash-light of what they were doing.

When the messages from the wreck were most discouraging, when there was a frenzied appeal for aid in every word spelled out by the flash-light, a bomb gun was set up on the cliff by Captain Dahlgren of San Francisco. The first four lines fell short and did not reach the vessel. This was conveyed by messages from Lovejoy's lamp. But the effort put fresh heart into the unfortunates on the ship and rekindled hopes of a rescue.

Then came Captain Nelson and his men from the Golden Gate Life Saving Station with a gun of long range. The first line was shot out. It fell short as had the others.

"A little higher next time." signalled Lovejoy. Then a few seconds later as if in answer to an unspoken question:

"We're all O. K."

To this Baxter answered:

"Keep up your courage."

And so the night wore on with exchanges of messages conveying cheer and hope, while again and again the life savers sought to shoot a line to the vessel.

"Shoot once more," flashed Lovejoy's signal. "We're breaking up fast."

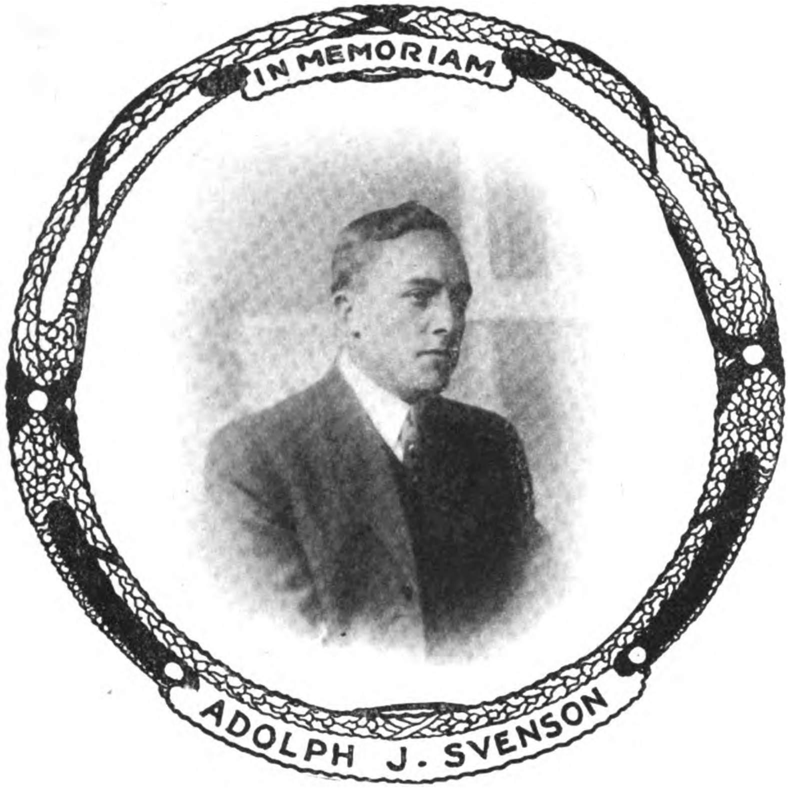
Another line hurtled towards the reef. But even as the rope went out into the night a wave larger than any of the others and given added force by the rising tide, lifted the vessel up from the reef and cast her down again with a crash. There was a deep silence. Then above the roar of the surf faint cries were heard—the cries of those who were appealing for help which they had little hope could be extended to them.

The fog had lifted and the men and women who were patrolling the beach could make out the faint outlines of the mainmast as the hulk disappeared beneath the waters; it was evident that the wreck was split into three parts which were rapidly drifting inshore.

Into the surf waded the watchers. The waves beat against them with terrific force, but the rescuers had caught sight of human flotsam in the foam and they determinedly held their ground. The first to be pulled out of the sea were five men who, after they had partly regained their strength, were able to tell their names and the conditions aboard the wreck. But no sooner had these five been taken to a place of shelter than the crunch of heavy wreckage showed that the remains of the Hanalei were close to the shore.

The cries which had been heard when the vessel broke to pieces again resounded in the ears of the rescuers. This time they were close at hand—under the mass of timbers which was pounding and washing on the beach. And from the debris, one by one, the victims were taken.

When dawn broke a large piece of wreckage on which were some dozen men was sighted near the outer edge of the combers. From the life savers' gun a line was shot directly over the raft and



rescue. Hot coffee was prepared at the hotel maintained by the Marconi Company and served to the rescued wreck victims as fast as they reached the shore.

A piece of wreckage was the salvation of Operator Lovejoy. When the ship broke up he and five other men sought refuge on this raft. A line shot from a mortar at Bolinas fell across the wreckage and was caught by one of the men. Instead of tying it to the raft, however, he and three others grasped the rope and were pulled ashore. Lovejoy and the other man remaining on the raft were picked up later by the revenue cutter McCulloch and taken to San Francisco.

caught by one of the occupants. Then Captain Nelson ordered his men to heave on the line until the raft had been swung clear of the other wreckage. Some on the wreckage jumped overboard and, seizing hold of the line, made their way toward the shore until they reached shoal water. Here it seemed as if every wave would batter them into unconsciousness. They held on their way steadfastly, however, and with the aid of the life savers who leaped into the water to seize them, arrived exhausted on the beach. The others on the raft were picked up by a power boat.

Twenty-eight of those who were saved found their way to the beach. Some swam, others clung to wreckage and several were borne ashore unconscious on the crests of waves. Other rescues were effected by the crew of the McCulloch and men from life-saving stations.

Manager Baxter and other men attached to the Bolinas station risked their lives in the surf to aid in the work of

Reports of the wreck show that Svenson conducted himself in a gallant manner while he and the others were facing death. Lovejoy said that he last saw Svenson soon after the ship broke to pieces, clinging to a piece of the hull. Svenson's body was later picked up and taken to the morgue in San Francisco.

Lovejoy was born in Hillsdale, Kas., June 27, 1891. He attended school until he was nineteen years old and then his ambitions turned toward wireless telegraphy. He entered the wireless field on March 31st, 1910, at Seattle, Wash., and has been engaged in radio work continuously since that time.

Svenson was born in Astoria, Ore., September 22, 1895. He completed his education in 1912 and on October 10 of that year entered the service of the Marconi Company as an operator.

The "Emergency Man" on the Wrecked Hanalei

He Was L. A. Lovejoy, the Wireless Operator, Who Carried on His Work with Perseverance

From The San Francisco Call.

There has been added to the heroes of the sea the name of another wireless operator, L. A. Lovejoy, the young man who had the wit to utilize his knowledge of telegraphy and who kept the victims of the Hanalei buoyed up in the deepest darkness and stress of their plight by his flashlight communications with the shore.

In a disaster where so much heroism was displayed, where practically every man and woman on the ship showed the highest courage, and where the watchers on the Bolinas shore vied with each other in heroic efforts to aid the shipwrecked, it is perhaps unfair to select one name from among all the others for especial distinction. The survivors tell of heroisms of fellow passengers, who made every effort to help others, witnesses tell of the bravery of newspaper photographers and reporters, sent to the wreck in the line of their routine work, who stood neck deep in the surf to save the lives of persons hurled through the breakers. The members of the life-saving crews risked their lives in the routine of their noble and hazardous duty. Elwood Schwerin, the University of California student, who swam ashore as a volunteer with a line, deserves especial mention.

Why Lovejoy stands out particularly among the others, whose bravery was no less nor no more than his, is because he proved himself a man for an emergency. He had his wit as well as his heart well in hand. When his wireless apparatus failed, Lovejoy, in the darkness, took his pocket electric flash and communicated by the Morse system of light flashes with men on shore who understood the code.

The Emergency Man is the valuable man. The wretched men and women clinging to the wreck learned through Lovejoy that help was at hand. The dots and dashes of light told the operator that superhuman efforts were being made to effect the rescue of his companions and his words of encouragement kept up hope in the face of the deadly conspiracy of waves and rocks.

Lovejoy proved the man for the emergency and it is taking credit from no other to select him for especial mention, because his trade had trained him to be of superior service to his fellow sufferers and he seized his opportunity for that service.

MY STORY OF THE WRECK OF THE HANALEI

By Loren A. Lovejoy

I believe that a recital of the circumstances incidental to the loss of the Hanalei will have an especial interest for wireless men, coming as it does from an operator who was on the vessel from the time she struck until she broke up. As briefly as possible therefore, I will set down what I observed during the tense, anxious hours following the Hanalei's accident up to the time when I was picked up from a bit of wreckage by life savers.

The Hanalei was one of the best known boats plying in the coastwise trade of the Pacific, having figured considerably in poetry and fiction stories. John Fleming Wilson used the vessel in his story, "Across the Latitudes," one of the principal characters being drawn from McTeague, chief officer of the vessel. She was a small steamship and carried a crew of only thirty with accommodations for seventy-five passengers.

I was acting in the combined capacity of purser and first wireless operator, having joined the vessel recently. About the time I received my detail aboard her she had been transferred from the southern run to San Pedro to the Eureka trade.

It happened that on the day of the wreck I had come on duty about seven o'clock in the morning. Operator Svenson, my assistant, had turned in and I set about attending to routine duties. As I logged our having passed Point Reyes, thirty-five miles from San Francisco, a heavy fog was threatening. It was a considerable distance in the air, however, and the Point was plainly visible. It was necessary for me to see Captain Carey regarding some business connected with the ship later in the morning and I called Svenson, asking him to relieve me for a few minutes. I returned soon afterward, relieving Svenson, and he went below for luncheon.

We were both in the wireless room at ten minutes to twelve and I was arranging to go below when we felt the ship strike heavily; then her engines stopped. I left Svenson in charge and immediately reported to Captain Carey on the bridge. He ordered me to send the distress call; he also wanted to know what ships were near us and just where they were.

I had heard the wireless of the El Segundo a short time before and knew that she was not far from us. So I instructed Svenson to send the S O S and to call the El Segundo (WTQ). Then I reported to Captain Carey. I told him what I had done and informed him that I would go below and assemble the passengers in the saloon, taking care that each one was provided with a life preserver. When I returned to the upper deck I gathered together all of the ship's papers and valuables, placing them in the inside pocket of my vest. Then I put on a life preserver and made my way to the bridge.

In the meantime Svenson had been busy in the wireless room, and when I reached the bridge a quartermaster told me that my assistant wanted to see me. The reason for this summons, it developed, was due to the fact that the current from the ship's dynamo had dropped so low that it was impossible to use the main wireless set. The storage batteries which we used for the auxiliary set were submerged by water which had entered the wireless cabin and we were unable to keep up furthr communication.

In this crisis I turned to Chief Engineer Pettingill and he told me that the engine room was flooded, the fires having already been extinguished. He said that he would not consider the plan of sending a man below because the vessel was leaking considerably and the water in the engine room was increasing in depth every minute. When he realized, however, that our only means of communication depended on the supply of the ship's electrical current, he himself went below, and standing waist deep in the water, managed to obtain a sufficient

head of steam to operate the dynamo for a few minutes.

This enabled me to flash the S O S again. I gave our position also and added that we were being pounded to pieces on the rocks. My signals were picked up by the Bolinas high power station, the San Francisco Marconi station at Hillcrest, the El Segundo and the revenue cutter McCullogh. The operator on the El Segundo responded almost immediately to my call, saying that his vessel was sixteen miles south of Duxbury Reef at noon and was steaming to our aid at full speed. I acknowledged his communication and had just started to call San Francisco when our power once more failed. This was due to the fact that our boilers had again become dead.

The chief engineer having informed me that he could do nothing toward starting the fires, I reported the situation to Captain Carey and then turned my attention to the auxiliary apparatus. While I was examining the set a heavy sea struck the vessel and she listed suddenly from starboard to port. As a result the water, which had partly filled the cabin, ran out on deck, leaving the storage batteries clear.

Drying the batteries as thoroughly as possible, I tested the set and was delighted to find that I was able to obtain a small spark. I was greatly encouraged by my success and, after requesting the chief engineer to remain nearby to aid me in the event of anything unforeseen happening, I established communication with the El Segundo. My message to her was a request to hurry the rescue work as we were breaking up rapidly. Then, without waiting for a reply, I asked San Francisco if the life savers had been advised of our plight. I received an assurance that everything possible had been done to render assistance and that a crew of life savers as well as the McCulloch and the tug Hercules had been sent to the scene of the wreck.

Barely had I acknowledged this message when a tremendous wave broke

Among the wreckage which drifted ashore was the wireless cabin of the Hanalei; a great deal of the apparatus was undamaged except for the soaking it had received

over the deck. The water poured into the wireless cabin in a great deluge and I should certainly have been swept over the side of the vessel if the chief engineer had not seized me and drawn me out of the maelstrom. It was a narrow escape and I feel that I owe my life to Mr. Pettingill, who somehow reached and held me while the wall of water receded. But although I had escaped the seas, the wireless cabin had not, the waters having swept it and the radio equipment overboard.

With the disappearance of the radio outfit my usefulness as an operator ended and I made my way to the saloon to spread the news of the preparations that were being made for our rescue to the anxious folk huddled together in the saloon. The tidings cheered them considerably because just about this time four of the five men who had made an attempt to reach shore with a line in one of the Hanalei's boats were pulled aboard, their craft having been dashed to pieces and one of their number drowned.

When I returned to the upper deck I endeavored to signal to those on shore by means of the fog whistle, using the Continental code. Manager Baxter of the Bolinas station heard me and tried to answer with an automobile siren, but because of the roaring of the surf the plan failed.

In the meantime McTeague—our chief officer—had taken the small line gun which weighed approximately thirty-five pounds, and mounting it high on the forecastle head, prepared to fire a line ashore. Something went wrong—I don't know what; either the gun was insecurely fitted to its mountings or it backfired. At any rate, I saw the flash of the discharge and heard the report and then McTeague was hurled backward against the captain with terrific force. He was severely bruised and suffered considerably from shock. The line that was fired failed to reach shore and it developed that there was no more ammunition for the gun, so plans for using it again were abandoned.

The Hanalei gradually began to break up about this time. The main topmast broke and went overboard with a crash and soon afterward the foremast toppled over. It was the beginning of the end for the vessel and, gathering the passengers and the crew on the upper deck on the starboard side, we awaited developments. We could see only a short distance as the fog continued thick and impenetrable. To the seaward, however, we could heard whistles, which we answered with blasts from our siren. An attempt was made to launch one of our starboard life-boats, but it was swamped and pounded to pieces a few minutes after it struck the water.

It was late in the afternoon when the crew of the life-saving station from the Cliff House approached the wreck. Their attempts to reach us resulted in failure, their boat finally being capsized. The captain of the crew was carried toward the shore by the waves and picked up by the rescuers on the beach, while two of the men clung to the life-boat. They succeeded in righting it and clambered aboard. The third man was rescued by the crew of the McCullogh, which was not far away.

As darkness came on, the fog gave promise of lifting somewhat. The officers of the vessel and I knew that with the disappearance of daylight the fears of the passengers would increase and we used every means at our command to improve their spirits. With the waves threatening to break up the Hanalei at any moment and the rescuers unable to approach the vessel, the chances of reaching shore alive seemed not altogether bright. But the little band of castaways on the Hanalei showed fortitude and fine courage in those trying hours, even the women and girls keeping up a brave front. When the prospect of effecting a rescue looked darkest the latter began to sing. And the songs were not of the doleful order either. I recall that one girl livened up the spirits of every one by singing "You'll Never Know What a Good Fellow I've Been Till I've Gone Away."

After a while faint beams from the moon pierced the fog. Then we caught sight of lights glimmering on the shore which, we afterwards learned, were bonfires built by the watchers on the beach

to cheer us and provide warmth for themselves.

The sight of the fires suggested to me the plan of signalling to those on shore by flashlight. I realized that it would be comparatively easy for one of the Marconi men to understand my signals and that the establishment of communication between the Hanalei and the beach would aid materially in the rescue work. I had a small pocket flash-lamp and with this in hand I clambered into the rigging and began to make the characters of the letter G. This I repeated again and again, followed by the letters LA. I knew that G was Manager Baxter's personal sign and LA was my own.

Some time passed before I had a response to my signals. Finally it came and then I knew that I had "landed." Baxter, as I afterward learned, also used a pocket flash-lamp for signalling and it was not long before our communications became clear to each other. I told him that we were rapidly breaking to pieces and that if any action was planned it should be taken at once. I also asked him to shoot us a line.

He replied that there was no cannon at Bolinas, but that one was on the way to the beach. A breeches buoy was being rigged up for use in the event of a line reaching us, he said. We were in communication for a long period during the night and I gave him the details of our position, the number of passengers on the Hanalei and other information.

At length the cannon to which he had referred arrived and I tried to aid them in their aim by means of my light. But their lines fell short and I signalled them to "Hurry, hurry, try again." Baxter replied that the cannon was so hot from repeated firing that it would be necessary to wait for a short time before discharging it again. I signalled to load the gun up well and evidently this was done because when the next attempt was made to fire it the mortar burst. Thus another possible means of rescue was destroyed and we on the Hanalei were forced to seek consolation in waiting and hoping.

Captain Carey and his crew then tried to send lines to the beach by fastening them to ties in the hope that the latter would float ashore. This plan proved to be a failure, however, and we were compelled to pin all of our hopes on the efficiency of a big line gun which was being conveyed to Bolinas. Baxter informed me of this by signalling, telling us to take heart as our suspense would be ended when the cannon arrived.

But once it was mounted and began shooting lines out to us we realized that we were again destined to disappointment; for although they fell across the wreck we could not reach them because of the position of the vessel and the waves that broke over her.

It was now early morning and as the hands of our watches neared three o'clock we realized—at least those among the seafaring folk did—that the critical point in our adventure was at hand; we knew that at that hour would come the first of the flood tide, and it was only too plain that when the vessel became the plaything of both the tide and the tremendous waves she would go to pieces quickly. With this thought in mind I signalled those on shore to shoot another line to us, as the vessel could hold together for only a short time.

Finally—a few minutes before three o'clock—I sent my last message. I said that we were all coming ashore as best we could. Then I signalled "Good-bye." Soon afterward the timbers of the vessel gave way with a shivering, grinding crash and before we knew it we found ourselves in the water.

How I really got into the sea I don't remember. I grasped a piece of wreckage—I think it was a part of the stern of the Hanalei—and next discovered that my hands and clothing were covered with crude fuel oil. Then I knew that the oil tanks on the Hanalei had burst. I was eventually picked up by a life-boat about 100 feet from shore and taken aboard the McCulloch. The latter conveyed me to San Francisco where I boarded the good ship Morpheus and enjoyed a twenty hours' cruise.

Throughout my account of the wreck of the Hanalei I have described the occurrences and incidents of the wreck rather than the persons who figured in them. But it seems fitting to mention

Operator Svenson, my co-worker, who throughout our terrible experience remained cool and resourceful, upholding in an exemplary manner the traditions of the Marconi service. Then there were Manager Baxter, who "stood by" with the signal lamp through the long hours of the night, and Chief Engineer Pettingill, whose bravery should not be forgotter. Those men and others showed their mettle in a crisis that taxed the courage of the strongest.

While Manager Baxter was in the operating room of the Bolinas station he heard the Hanalei blowing distress signals.

"At the first blast," he said, "I ordered Operator Bartlett, who was on duty at the time, to tune down as low as possible and see if he could get any word of the vessel's position or her name. Bartlett was able to receive only the last words sent by the operator on the ship, but he heard our San Francisco station sending out the S O S call for all ships and stations, saying that the Hanalei was on the rocks, sixteen miles south of Poim Reyes. This was enough to send me hurrying to the bluff where I was joined by several other Marconi men.

"We attempted to shout to the men on the vessel, but the roar of the surf drowned our voices and then George Hanson, our chief rigger, ordered his men to bring out rope and gear for rigging up a breeches buoy. Bartlett had joined the group of Marconi men by this time and when a life-boat with a line over her stern was seen drifting inshore he and Moorhouse went into the surf in an attempt to pull it on to the beach. They finally had to abandon the attempt, the force of the waves being too great for them to combat. When the boat was eventually washed ashore the line proved to be nothing but an extra long painter. The boat had been swept overboard after the Hanalei struck the reef.

"We made out a man swimming through the surf at about half past five o'clock in the afternoon. He seemed cool and deliberate and, although he was being pounded by the wreckage floating about him, he continued to swim. Another man and I rushed into the surf as far as we could possibly go. I was struck by a piece of wreckage and knocked down. I managed to get on my feet in time to seize the swimmer, however, and with the assistance of my companion, we dragged him ashore.

"The rescued man was Elwood Schwerin, of Berkeley, who had evidently started to swim ashore with a line from the ship, because almost his first words after he had recovered from his exhaustion were 'Did you get the line?'

"Among the wreckage which drifted ashore was the wireless cabin of the Hanalei. Bartlett and I entered the cab as soon as the water had receded enough to allow us to do so. We were amazed to find that a great deal of the apparatus was apparently undamaged except for the soaking it had received. We found the tuner with the antenna switch thrown off, while the antenna switch was in the sending position and the auxiliary coil was hooked in. The helix had been twisted from its stand and the condenser rack was badly damaged, but several jars were unbroken."

Baxter, in describing the flashlight signalling, said that at first an attempt was made to communicate with Lovejoy by holding a hat over an automobile headlight at intervals.

"I flashed them every word of cheer that I could," said Baxter. "I recall that after one request to hurry the rescue work I flashed, 'Keep heart.' Lovejoy replied that he had his heart in his hand and that he would surely hang on to it. Bartlett, McNess and Sanford were with me at different times after midnight and I dare say that it took the four of us because of our emotions to read some of the messages from the ship."

In "My Autobiography"

S. S. McClure, the famous magazine publisher says:

"McClure's was the first popular journal to announce Marconi's discovery of wireless telegraphy, and when that article appeared it was generally regarded with utter incredulity. I remember, a professor of Clark University wrote on that occasion, and urged us to avoid announcing such absurdities and thereby making the magazine ridiculous."

The article referred to and a subsequent one —milestones in the recorded progress of the wireless art—are presented on the pages following to give fuller appreciation of the triumphs to be ushered in during the year **1 9 1 5**

This is the article pronounced an "absurdity" when it appeared in McClure's Magazine in March, 1897

The illustrations have been faithfully reproduced from the original article

TELEGRAPHING WITHOUT WIRES

A Possibility of Electrical Science

By H. J. W. Dam

I.

THE MYSTERIES OF THE ETHER.—AN INTERVIEW WITH DR. BOSE.

A YEAR has elapsed since Röntgen gave us the new photography. To-day, on the same general lines, we are confronted with something more wonderful, more important and more revolutionary still—the new telegraphy. Two gentlemen have come to London at the same time from different countries to tell the same story, namely, that telegraphy needs no wires, and that through walls, through houses, through towns, through mountains, and, it may possibly happen, even through the earth, we can send dispatches to any distance with no other apparatus than a sender and a receiver, the communication taking place by means of electric waves in the ether.

The English language uses the word "ether" in two totally different senses. The first is as the name of a colorless liquid, easily vaporized, the vapor of which is used to allay pain. This liquid has nothing whatever to do with the present subject, and should be put entirely out of the mind. The second use of the word is as the name of a substance colorless, unseen, and unknown, we will say—except in a theoretical sense—which is supposed to fill all space. The original conception of this substance is as old as Plato's time. Newton, Descartes, all the beacon lights of science through the ages, have assumed its existence, and all modern physical students accept it. The ether theory of the formation of worlds must be familiar to many. In fact, up to twenty years ago, as the men of to-day who were then in college will remember, the word "ether" was a familiar name, a harmless necessary conception, a great convenience in bridging a tremendous void in science which nobody knew anything about or ever would know anything about, so far as could then be seen.

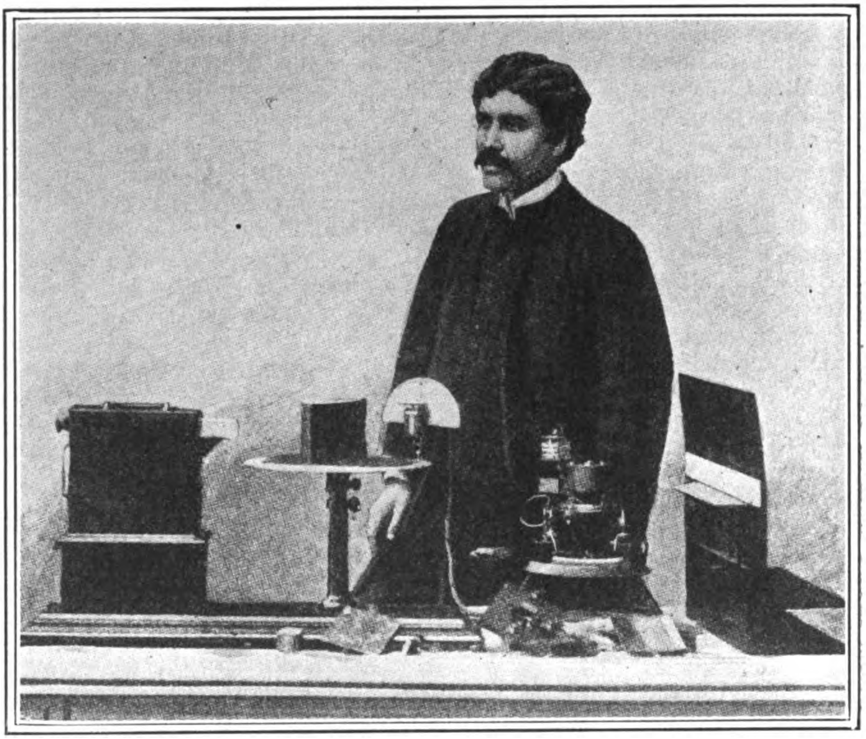
But the electrical advance in the last twenty years has been most extraordinary. Invention and experiment have daily, if not hourly, thrown open new doors in the electrical wing of the temple of truth. And now, at the close of the nineteenth century, the great mass of new facts concerning light, electricity, inaudible sound, invisible light, and the Lenard and Röntgen rays; the eager inquiry, based upon new discoveries, into the properties of living matter, crystallization, the transference of thought, and the endeavor to establish scientifically the truth of certain great religious concepts—all the special sciences thus represented, marching abreast of one another along the old Roman road of science, which leads no one knows whither, have come upon a great high wall blocking the way completely in all directions. It is an obstacle which must be conquered in whole or in part before science can go any farther. And upon the wall, as upon the wall in the palace of Babylon, is a strange and as yet unintelligi-

ble inscription—the mysterious word "ether." What new and great discoveries lie beyond this wall, no one knows; but more than one high authority believes that these discoveries will startle the twentieth century more greatly than the nineteenth has been startled.

To suggest, in the crudest possible fashion, how ether is at present regarded by scientists, let the reader imagine that the whole universe, to the uttermost stars, is a solid mass of colorless jelly; that in this colorless jelly the stars, solar systems, and space-worlds are embedded, like cherries in a mould of fruit jelly for the table; that this jelly, though it is at present believed to have density and rigidity, is so inconceivably thin that it soaks completely through all the cherries and through everything upon them; that the minute atoms composing the cherries are so large when compared with the thinness of the jelly that each atom is surrounded by the jelly as the whole cherry is surrounded; that the jelly is continuous, without a point in the whole universe at which there is a single break in its continuity; that, consequently, if we tap the glass containing the jelly on the table a quiver will run through the jelly completely; the cherries will not quiver, but the quiver will run through them, the jelly which has soaked into them carrying the quiver through them as easily as through the spaces between the cherries; that, in short, this jelly or ether is a universal substance so thin that it permeates everything in space and on earth—glass, stone, metal, wood, flesh, water, and so on—and that only by its quivering, only by the waves in it which light rays, electric rays, and Röntgen rays excite, are these rays enabled to travel and produce their various results. Light enables us to see. But all the light which comes to us from any object and enables us to see that object comes by means of waves in the ether. These light waves pass through glass; that is, the wave continues right through the glass in the ether which lies between the particles of glass. From causes yet undefined, the ether carries light rays through certain substances, but will not carry Röntgen rays through those substances. Röntgen rays, on the other hand, are carried through substances which stop light. Electric rays, or electric rays of a low rate of vibration, differ in some respects from both light and Röntgen rays in the substances which they can traverse. Electric rays of high oscillation show other differences still. Other classes of rays or waves which remain to be discovered, and which will also have different properties, will doubtless be found to receive different treatment from the ether, the sum and substance of the whole matter being that the comparatively new research for new rays has now concentrated the whole scientific world's attention on the ether, its different treatment of different rays affording to-day a means of studying it that has never been enjoyed before.

Dr. Jagadis Chunder Bose

The density of the ether has been calculated from the energy with which the light from the sun strikes the earth. As there are twenty-seven ciphers after the decimal point before the figures begin, its density is of course less than anything we can imagine. From its density its rigidity has been calculated, and is also inconceivably small. Nevertheless, with this small rigidity and density it is held to be an actual substance, and is believed to be incompressible, for the



Dr. Bose and his apparatus for the study of electric radiation

reason that otherwise it would not transmit waves in the way it does. As it is believed to fill all the interplanetary space, many profound and searching experiments have been made to determine whether, as the earth moves in its orbit through space at the rate of nineteen miles per second, it passes through the ether as a ship goes through the water, pressing the ether aside, or whether the ether flows through the earth as water flows through a sieve forced against it. Through the elusive character of the substance none of these experiments have as yet produced any very satisfactory results. It has been found, however, that the ether enclosed in solid bodies is much less free in transmitting waves than the ether in the air. Thus glass, alone, transmits light waves at the rate of about three miles per second. The ether in the glass transmits them at a rate 40,000 times greater, or about 120,000 miles per second, while the ether in the air transmits them at the rate of 192,000 miles per second. The reason why the ether in the glass and other solids transmits more slowly than that outside is a mystery at present; but, as said before, this is one of a mass of gathered facts which have now placed science in a position from which it is possible to attack the mystery of the ether.

Electric waves were discovered by an American, Joseph Henry, in Washington, D. C., in the year 1842. He did not use the phrase "electric waves"; but he discovered that when he threw an electric spark an inch long on a wire circuit in a room at the top of his house, electrical action was instantly set up in another wire circuit in his cellar. There was no visible means of communication between the two circuits, and after studying the matter he saw and announced that the electric spark set up some kind of an action in the ether, which passed through two floors and ceilings each fourteen inches thick, and caused induction—set up what is called an induced current—in the wires in the cellar. This fact of induction is now one of the simplest and most common-

place phenomena in the work of electricians. Edison has already used it in telegraphing to a flying train. Hertz, the great German investigator, developed the study of these waves, and announced that they penetrated wood and brick but not metal. Strange to say, however, considering the number of brilliant electricians in the more western countries to-day, and the enormous amount of interest in and experimental investigation of electrical phenomena therein, it has been left to a young Italian, Guglielmo Marconi, to frame the largest conception of what might be done with electric waves and to invent instruments for doing it. Marconi's story will be told with the utmost simplicity and care. But it sounds like a fairy tale, and if it had not for a background four grave and eager committees representing the British Army, the British Navy, the British Post-Office, and the British Lighthouse Service, which are now investigating it, it might well be doubted.

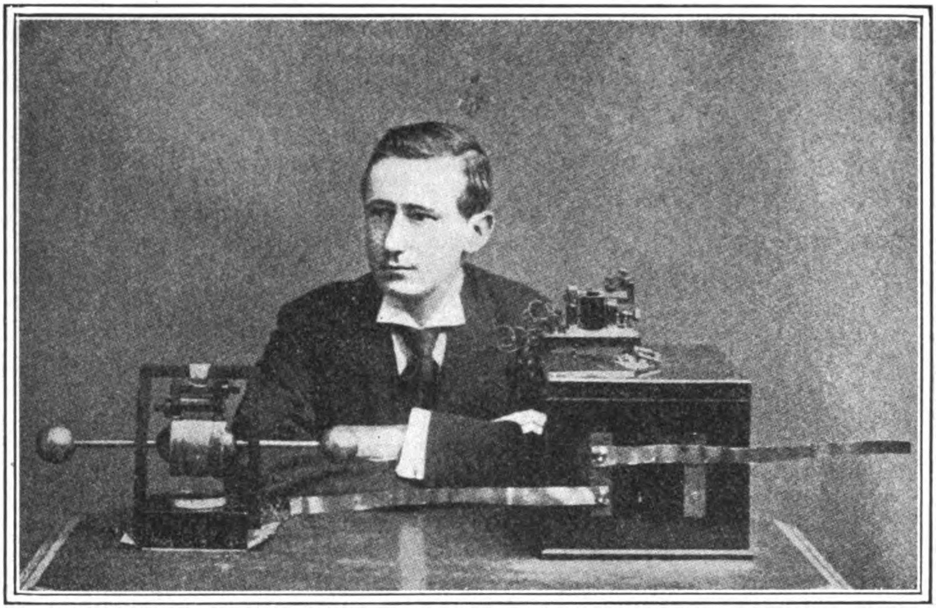
Before introducing Marconi, however, the attention of the reader is called, for several good reasons, to his immediate predecessor in London, Dr. Jagadis Chunder Bose. Dr. Bose is a Hindoo, and is at present the Professor of Physics in the Presidency College, Calcutta. He is a graduate of Cambridge, with the degree of Master of Arts, and has been honored with the degree of Doctor of Science by the University of London, as a recognition of certain inventions regarding electric waves which have won him the highest praise in the Royal Society, the British Association, and elsewhere. It should be said at once that Dr. Bose has no interest in the new telegraphy. Though he has been named as its discoverer, he has done little more in it than was announced by Hertz in 1888. He has done great work in his own field, but it is that kind of detail work which is only understood and appreciated by other investigators, and in the matter of telegraphy his statements are here given largely as a preparation for and corroboration of those of Marconi.

Dr. Bose, as he sits in the drawing-room of his temporary London home in Maida Vale, is a man of medium height, thirty-six years old. His father was a distinguished scholar and mathematician. His manner is modest and very reserved. He dislikes publicity in the extreme. To be interviewed for publication, and to have his delicate, complex, and ultra-technical work described in the non-technical language of a popular magazine is something from which he shrinks visibly. Consequently, though he submits to the ordeal of an interview, he disclaims all responsibility for the statements made in it and the language in which these statements are expressed. If any man of science, therefore, reads this article, it is understood that he is to base no opinion or criticism upon it; but if he is interested in Dr. Bose's work, he is requested to refer to the Journal of the Royal Society for December, 1895, and June, 1896, and the Journal of the British Association meeting of this year. The ethereal waves of courtesy between speaker and writer having vibrated to the conclusion of this happy understanding, Dr. Bose says:

"My special work for the last three years has been the study of electric radiation; more particularly the comparatively slow electric waves, varying between about one-quarter and about one-half an inch in length. My results were represented in the complete apparatus which I had the honor of describing before the British Association, an apparatus for the verification of the laws of reflection, refraction, selective absorption, interference, double refraction, and polarization of these waves. I also contributed a paper to the Royal Society in December, 1895, on the determination of the indices of refraction of various substances for the electric ray, and another in June of this year [1896] on the determination of the wave length of electric radiation by means of a diffraction grating. These have been duly reported and discussed in the scientific journals, and I fear would not be appreciated or understand outside of their circle."

This is too evident a fact to be disputed, and the conversation is turned to the wave-telegraphing in Calcutta.

"That," said Dr. Bose, "was simply an incident in the course of a popular



Signor Marconi and his earlier apparatus for telegraphing without wires

lecture, an illustration of the ability of electric rays to penetrate wood and brick. My radiator was a small platinum ball between two small platinum beads, connected with a two-volt storage battery. By pressing a key the ball was made to spark and start an electric wave which progressed outward through the ether in the air. Popularly speaking, an electric wave in the ether, though it moves in all directions, progresses outward like a wave produced by dropping a stone in a pond. The water wave can be seen. An electric wave is, of course, invisible. Supposing a cork on the surface of the pond at any distance from the place where the stone was dropped, the cork, when the wave reaches it, will bob up and down. Now, though we cannot see the electric wave, we can devise an arrangement which indicates the presence of the wave as the cork does. This mechanical arrangement detects and records the passage of the wave.

"This is the whole idea simply expressed: an electric radiator and a receiver for the waves. My receiver was in a room seventy-five feet distant from the radiator, with three walls of brick and mortar, eighteen inches thick, between them. The electric wave thus induced penetrated the walls and traversed this distance with sufficient energy, when it was converted, to fire a pistol and ring a bell, these being the simplest and best evidences of its reception that I could devise."

"Do you mean to say that the wave, outgoing in all directions, had this effect when a very small part of it reached the receiver?"

"No. A large portion of it was concentrated, as rays of light are concentrated, by a lens placed close to the radiator. This received a large portion of the wave and bent all the rays which fell upon it into parallel lines, thus making a beam proceeding outward in a straight line through the walls to the receiver. I have made and used various concentrating lenses, the best materials being sulphur, ebonite, and pitch."

"Instead of ringing a bell or firing a pistol, could a telegraph message have been sent with it and received through the walls?"

"Certainly; there would be no difficulty about that."

"What is the law describing the intensity or power of the wave at any given distance?"

"Exactly the same as the law of light. Generally speaking, these electric waves act like rays of light."

"Do you mean to say, then, that you could telegraph in this way through houses as far as you could send a beam of light, say with a search-light?"

"I would not like to say it in these terms, but, generally speaking, such is the fact."

"How far could this ether dispatch, so to speak, be sent?"

"Indefinitely. That depends on the exciting energy. At Salisbury Plain, I am told, electric rays were sent with a parabolic reflector a quarter of a mile through the ether in the air, and then reproduced as Morse signals by a relay."

"But in telegraphing through houses —across a block of houses, for instance —supposing the lens and reflector properly aimed at the receiver, what would stop the rays?"

"Metal stops the waves I have been working with. Also water. They will penetrate wood, brick, glass, granite, rock, earth, and retain their properties."

"How far have they been successfully sent?"

"Through the air? I believe a mile. Through three walls? A distance of seventy-five feet, so far as I know."

"What is their relation with the Röntgen rays?"

This brought up the whole question of the differences in rays. Without committing Dr. Bose to exact language it may be said that the rays with which he is working are of comparatively slow vibrations, representing about fifty billion oscillations per second. Those ether vibrations which lie between 200 trillions and 400 trillions of vibrations in a second are heat rays, producing the sensation of warmth. Above 400 trillions and as far as 800 trillions per second the vibrations are light rays, producing the sensation of light. According to their rapidity, these light rays produce a gradation of colors. The lowest numbers of light vibrations give our eyes the sensation of red, and the scale mounts through the yellows, greens, and blues, to the violets. When the number of vibrations passes 800 trillions per second they become invisible. The human eye is limited in its perceptive power to vibrations between 400 trillions and 800 trillions. Below and above these numbers lie the regions of what are called "invisible light rays." The same is true of the ear. Sound is conducted by air vibrations. When these vibrations are below sixteen per second or above 32,000 per second, they make no impression on our ear drums and our consciousness. These are the so-called regions of "inaudible sound."

"I think the Röntgen rays," said the doctor, "lie above 800 trillions of vibrations per second."

"And what other unknown forces also lie in that upper region?"

"That remains for the future to develop. It is impossible to forecast what new facts the study of the ether is destined to give us. It is a tremendous field, from which we may expect new facts and new forces."

"New forces?"

"That is merely a phrase. Force is a confusing word. Say new forms of energy, enabling us to accomplish results now impossible—results now unthought of and unthinkable."

"Then the ether—"

"Is the great field of the future, a field whose products no one can imagine or attempt to conceive."

"Have you ever considered thought impulses generated by the brain, with reference to their radiation and reception by other brains, over small or great distances?"

"I have."

"What is your opinion with reference to thought transference?"

"I must decline to express it. There is no experimental basis upon which to make a satisfactory statement."

Dr. Bose would say no more for publication. Opinions and convictions as to the unexplored regions of physical phenomena are the luxury of every scientific thinker, but he does not express them except under the seal of confidence. It was a delight, however, to hear this wise man of the East, thinking and speaking the language of exact science, discuss the region of the occult. That Theosophy and Christian Science will shortly hug the ether to their breasts as the undoubted vehicle of their claimed marvels is entirely certain. The

present difficulty with regard to thought phenomena is that the human body is not a machine and cannot be used in an exact way to exact ends in experiments. That some one ingenious enough to accomplish this will ultimately appear is highly probable, however, and that the silent influence of brain on brain will in time be measured under mathematical conditions is as reasonable to expect as it would be rash to deny.

II.

THE NEW TELEGRAPHY.—INTERVIEW WITH SIGNOR MARCONI.

Guglielmo Marconi, whose name will doubtless be often heard in the years which lie before us, is a young Anglo-Italian. He was born in Bologna, Italy, and will be twenty-two years old next April. His father is an Italian gentleman of independent means, and his mother is an English lady connected with several well-known English families. He is a tall, slender young man, who looks at least thirty, and has a calm, serious manner and a grave precision of speech, which further give the idea of many more years than are his. He is completely modest, makes no claims whatever as a scientist, and simply says that he has observed certain facts and invented instruments to meet them. Both the facts and the instruments are new, and the attention they are at present exciting is extraordinary.

This attention is largely due to the enterprise and shrewdness of Mr. W. H. Preece, the able chief of the electrical department of the British postal system. Marconi's invention is a year old, but he could obtain no satisfactory recognition of it in his own country. Mr. Preece, however, had for a long time been at work upon the problem of telegraphing through the air where wires were not available. Last year the cable broke between the mainland and the island of Mull. By setting up lines of wire opposite each other on the two coasts, he was enabled to telegraph by induction quite successfully over the water and through the air, the distance being four miles and a half. He sent and received in this way 156 messages, one of them being 120 words in length. Ordinary Morse signals were used, the dispatches being carried by the ether in the air. In a late lecture at Toynbee Hall, Mr. Preece admitted that Marconi's system, which is electro-static, far surpassed his own, which is electro-magnetic. He expressed the fullest faith in Marconi, describing his inventions as new and beautiful, scientifically speaking, and added that he (Mr. Preece) had been instructed by the postal department to spare no expense in testing them to the fullest degree. It will be understood, therefore, that it is due to Mr. Preece that Marconi has received the fullest recognition in England and that engineers from four different departments of the English government are now supervising his work.

Marconi was educated at Leghorn, Florence, and Bologna, and has more recently been following his special study at his home in the last named city. He speaks English perfectly, and said, in his London home, in Westbourne Park: "For ten years past I have been an ardent amateur student of electricity, and for two years or more have been working with electric waves on my father's estate at Bologna. I was using the Hertz waves from an apparatus which you may photograph, a modified form of the apparatus for exciting electric waves as used by Hertz. My work consisted mainly in endeavoring to determine how far these waves would travel in the air for signalling purposes. In September of last year, working a variation of my own of this apparatus, I made a discovery."

"What was the discovery?"

"I was sending waves through the air and getting signals at distances of a mile, or thereabouts, when I discovered that the wave which went to my receiver through the air was also affecting another receiver which I had set up on the other side of the hill. In other words, the waves were going through or over the hill."

"Do you believe that the waves were going through the hill?"

"That is my present belief, but I do not wish to state it as a fact. I am not certain. The waves either went through the hill or over it. It is my belief, based

on many later experiments, that they went through."

"And what was the thickness of the hill?"

"Three-quarters of a mile."

"And you could send a dispatch with Morse signals through this hill or over it to some one on the other side?"

"With ease."

"What followed?"

"What followed was the conception and completion of my special invention, the instruments I have been using at Salisbury Plain in the presence of the Royal engineers. I find that while Hertz waves have but a very limited penetrative power, another kind of waves can be excited with the same amount of energy, which waves, I am forced to believe, will penetrate anything and everything."

"What is the difference between these and the Hertz waves?"

"I don't know. I am not a scientist, but I doubt if any scientist can yet tell. I have a vague idea that the difference lies in the form of the wave. I could tell you a little more clearly if I could give you the details of my transmitter and receiver. These are now being patented, however, and I cannot say anything about them."

"How high an alternation were you using?"

"About 250,000,000 waves per second."

"Do these waves go farther in air than Hertz waves?"

"No. Their range is the same. The difference is in penetration. Hertz waves are stopped by metal and by water. These others appear to penetrate all substances with equal ease. Please remember that the amount of exciting energy is the same. The difference is in the way they are excited. My receiver will not work with the Hertz transmitter, and my transmitter will not work with the Hertz receiver. It is a new apparatus entirely. Of course the waves have an analogy with the Hertz waves and are excited in the same general way. But their power is entirely different. When I am at liberty to lay my apparatus and the phenomena I have observed before the scientists, there may be some explanation, but I have been unable to find any as yet."

"How far have you sent a telegraphic dispatch on the air?"

"A mile and three-quarters. We got results at two miles, but they were not entirely satisfactory. This was at Salisbury Plain, across a shallow valley between low hills."

"What battery were you using?"

"An eight-volt battery of three amperes, four accumulators in a box."

"Did you use a reflector?"

"Yes. It was a roughly-made, copper parabolic reflector with a mistake of an inch in the curve. I shall not use one in future, however. A reflector is of no value."

"Nor a lens?"

"Nor a lens."

"Why not?"

"Because the waves I speak of penetrate everything and are not reflected or refracted."

After Professor Röntgen's distances of a few yards and limitations as to substances this was rather stunning. Marconi, however, was entirely serious and visibly in earnest in his statement.

"How far have you verified this belief?"

"Not very far, but far enough, I think, to justify the statement. Using the same battery and my transmitter and receiver we sent and received the waves, at the General Post-Office building, through seven or eight walls, over a distance of one hundred yards."

"How thick were the walls?"

"I can't say. You know the building, however. It is very solidly constructed."

"And you sent an ordinary telegraphic dispatch by those signals?"

"No. We did not do that, though we could have done so. We were working with agreed signals, and we obtained the taps which we sought and repeated them till there was no room for doubt."

"Do you think that sitting in this room you could send a dispatch across London to the General Post-Office?"

"With instruments of the proper size and power, I have no doubt about it."

"Through all the houses?"

"Yes."

We were in a drawing-room in Talbot Road, Westbourne Park, a distance of about four and one-half miles from the General Post-Office.

"And how far do you think a dispatch could thus be sent?"

"Twenty miles."

"Why do you limit it to twenty miles?"

"I am speaking within practical limits, and thinking of the transmitter and receiver as thus far calculated. The distance depends simply upon the amount of the exciting energy and the dimensions of the two conductors from which the wave proceeds."

"What is the law of the intensity at a given distance?"

"The same as the law of light, inversely as the square of the distance."

This means that whatever the energy with which the waves are sent out, their power at, say twenty feet, when compared with their power at ten feet would be in the proportion of 10×10 to 20×20, or one-fourth, in this special instance.

"Do you think they are waves of invisible light?"

"No; in some respects their action is very different."

"Then you think these waves may possibly be used for electric lighthouses when fog prevents the passage of light?"

"I think they will ultimately be so used. A constant source of electrical waves, instead of a constant source of light waves, and a receiver on the vessel would indicate the presence of the lighthouse and also its direction."

"But would not the fog interfere with the passage of the waves?"

"Not at all."

"Nor metal?"

"Nothing affects them. My experience of these waves leads me to believe that they will go through an ironclad."

"Concerning the size of the apparatus, how large is it?"

"The transmitter and receiver we have been using at Salisbury Plain and at the post-office are each about"—he held up his hands to indicate the dimensions—"say fifteen inches by ten by eight. Small ones, effective enough for ordinary purposes, can be made of half that size."

"What are you working on at present?"

"Mr. Preece and I are working at Penarth, in Wales, to establish regular communication through the air from the shore to a light-ship. This will be the first direction in which my apparatus is utilized—communication with the light-ships. The light-ships lie off this coast at any distance from half a mile to twenty miles or more."

"What length of waves have you used?"

"I have tried various lengths, from thirty meters down to ten inches."

"Why would not these waves be useful in preventing the collision of ships in a fog?"

"I think they will be made use of for that purpose. Ships can be fitted with the apparatus to indicate the presence of another ship so fitted, within any desired distance. As soon as two approach within that distance the alarms will ring on each ship, and the direction of each to the other will be indicated by an index."

"Do you limit the distance over which these waves can be sent?"

"I have no reason to do so. The peculiarity of electric waves, which was noted, I believe, by Hertz, is the distance they travel when excited by only a small amount of energy."

"Then why could you not send a dispatch from here to New York, for instance?"

"I do not say that it could not be done. Please remember, however, that it is a new field, and the discussion of possibilities which may fairly be called probabilities omits obstacles and difficulties which may develop in practical working. I do not wish to be recorded as saying that anything can actually be done beyond what I have already been able to do. With regard to future developments I am only saying what may ultimately happen; what, so far as I can now see does not present any visible impossibilities."

"How large a station would be necessary, assuming the practicability, to send a message from here to New York?"

"A station the size of this room in square area. I don't say how high." The room was twenty feet square.

"What power?"

"Fifty or sixty horse-power would, I think, suffice."

"What would be the cost of the two stations completed?"

"Under £10,000, I think."

"Would the waves go through the ether in the air or through the earth?"

"I cannot say with certainty. I only believe they would go that distance and be recorded."

"You say that no lens or reflector is of value. Then the waves would go outward in all directions to all places at the same distance as New York?"

"Yes."

"Do you think that no means will ever be found to stop this progress in all directions and concentrate it in one direction?"

"On the contrary, I think that invention will give us that."

"Do you see any way of accomplishing this?"

"No, not as yet."

"In what other directions do you expect your invention to be first utilized?"

"The first may be for military purposes, in place of the present field telegraph system. There is no reason why the commander of an army should not be able to easily communicate telegraphically with his subordinate officers without wires over any distances up to twenty miles. If my countrymen had had my instruments at Massowah, the reinforcements could easily have been summoned in time."

"Would the apparatus be bulky?"

"Not at all. A small sender and receiver would suffice."

"Then why would it not be equally useful for the admiral of a fleet in communicating with his various ships?"

"It would," said Marconi, with some hesitation.

"Is there any difficulty about that?"

"Yes," said he, very frankly, but in a way which set the writer to wondering. "I do not know that it is a difficulty yet, but it appears to be."

The writer pondered the matter for a moment. Then he asked: "Do you remember Hertz's experiment of exploding gunpowder by electric waves?"

"Yes."

"Could you not do the same from this room with a box of gunpowder placed across the street in that house yonder?"

"Yes. If I could put two wires or two plates in the powder, I could set up an induced current which would cause a spark and explode it."

"Then if you threw electric waves upon an ironclad, and there happened to be two nails or wires or plates in the powder magazine which were in a position to set up induction, you could explode the magazine and destroy the ship?"

"Yes."

"And the electric lighthouses we are speaking of might possibly explode the magazines of ironclads as far as light from a lighthouse could be seen?"

"That is certainly a possibility. It would depend on the amount of the exciting energy."

"And the difficulty about using your instruments for fleet purposes—"

"The fear has been expressed that in using the instruments on an ironclad the waves might explode the magazine of the ship itself."

It is perhaps unnecessary to say that this statement was simply astounding. It is so much of a possibility that electric rays can explode the magazine of an ironclad, that the fact has already been recognized by the English Royal engineers. Of all the coast defences ever dreamed of, the idea of exploding ironclads by electric waves from the shore over distances equal to modern cannon ranges is certainly the most terrible possibility yet conceived.

Such are the astonishing statements and views of Marconi. What their effect will be remains to be seen. In the United States alone, considering the many able experimenters and their admirable and original equipments, like Tesla's dynamos, the imagination abandons as a hopeless task the attempt to conceive what—in the use of electric waves—the immediate future holds in store. The air is full of promises, of miracles. The certainty is that strange things are coming, and coming soon.

Because underlying the possibilities of the known electric waves and of new kinds of electric waves, which seem to be numerous and various—underlying these is still the mystery of the ether. Here is a field which offers to thost college students of to-day who have already felt the fascination of scientific research, a life work of magical and magnificent possibilities, a virgin, unexplored diamond field of limitless wealth in knowledge. Science knows so little, and seems, in one sense, to have been at a standstill for so long. Lord Kelvin said sadly, in an address at Glasgow the other day, that though he had studied hard through fifty years of experimental investigation, he could not help feeling that he really knew no more as he spoke than he knew fifty years before.

Now, however, it really seems that some Columbus will soon give us a new continent in science. The ether seems to promise fairly and clearly a great and new epoch in knowledge, a great and marked step forward, a new light on all the great problems which are mysteries at present, with perhaps a correction and revision of many accepted results. This is particularly true of the mystery of living matter and that something which looks so much like consciousness in certain non-living matter, the property which causes and enables it to take the form of regular crystals. Crystallization is as great a problem as life itself, but from its less number of conditions will perhaps be easier and earlier attacked. The best conception of living matter which we have at present, completely inadequate though it be, is that of the most chemically complex and most unstable matter known. A living man as compared to a wooden man responds to all kinds of impulses. Light strikes the living eye, sound strikes the living ear, physical and chemical action are instantly and automatically started, chemical decomposition takes place, energy is dissipated, consciousness occurs, volition follows, action results, and so on, through the infinity of cause and infinity of results which characterize life. The wooden man is inert. There is no chemical or physical action excited by any impulse from without or within. Living matter is responsive, nonliving is not. The key to the mystery, if it ever comes, will come from the ether. One great authority of to-day, Professor Oliver Lodge, has already stated his belief that electricity is actually matter, and that if the ether and electricity are not one and the same, the truth will ultimately be found to be near that statement. If this be true, it will be a great and startling key to the now fathomless mystery of life.

The article finished above and the one immediately succeeding it on the next page represent a unique contribution to the beginning of the year 1915. Some interesting comparisons can be drawn between the present day casual reports of wireless achievements and these earnest documents which were laid before a suspicious public in 1897 and 1899.

That these reprints will be enjoyed by our readers to a degree proportionate with individual sophistication in the wireless art goes without saying—the originals have been unearthed only after a tireless search extending over months, and persisted in solely because of scores of requests from readers.

Next month it will be our pleasure to add some others of historical interest to all wireless men—The reports of the first trans-Atlantic work and an intimate view of the human side of this achievement.

IN THE FEBRUARY ISSUE

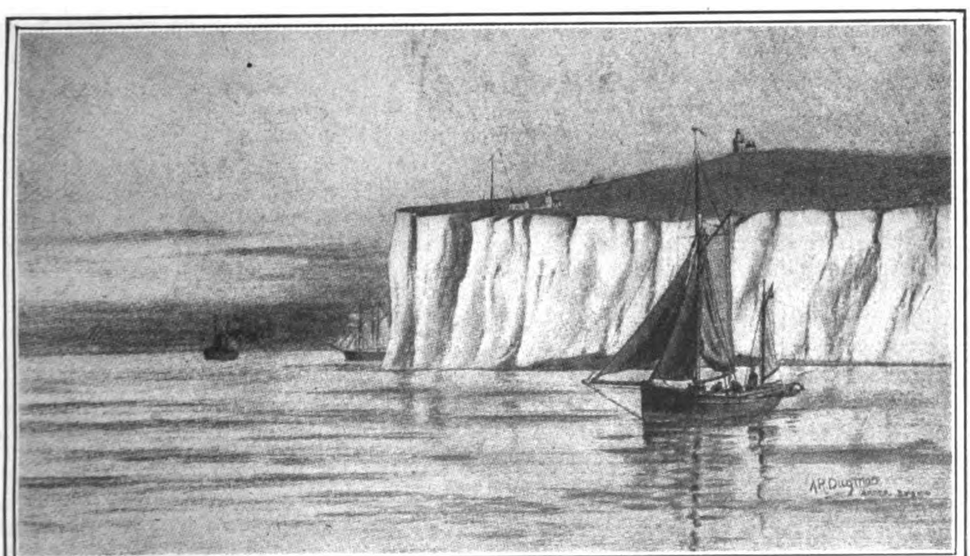
Two years saw a great change in public opinion. This article appeared in June, 1899.

Marconi's Wireless Telegraph.*

Messages Sent at Will Through Space. — Telegraphing Without Wires Across the English Channel

By Cleveland Moffett

MR. MARCONI began his endeavors at telegraphing without wires in 1895, when in the fields of his father's estate at Bologna, Italy, he set up tin boxes, called "capacities," on poles of varying heights, and connected them by insulated wires with the instruments he had then devised—a crude transmitter and receiver. Here was a young man of twenty hot on the track of a great discovery, for presently he is writing to Mr. W. H. Preece, chief electrician of the British postal system, telling him about these tin boxes and how he has found out that "when these were placed on top of a pole two meters high, signals could be obtained at thirty meters from the transmitter;" and that



South Foreland, the English station from which messages were sent without wires to Boulogne, France, thirty-two miles away. The mast supporting the vertical wire is seen on the edge of the cliff

*All the illustrations have been faithfully reproduced from the original article.

"with the same boxes on poles four meters high signals were obtained at 100 meters, and with the same boxes at a height of eight meters, other conditions being equal, nearly up to a mile and a half. Morse signals were easily obtained at 400 meters." And so on, the gist of it being (and this is the chief point in Marconi's present system) that the higher the pole (connected by wire with the transmitter), the greater was found to be the distance of transmission.

In 1896, Marconi came to London and conducted further experiments in Mr. Preece's laboratory, these earning him followers and supporters. Then came the signals on Salisbury Plain through house and hill, plain proof for doubters that neither brick walls nor rocks nor earth could stop these subtle waves. What kind of waves they were Marconi did not pretend to say; it was enough for him that they did their business well. And since they acted best with wires supported from a height, a plan was conceived of using balloons to hold the wires, and March, 1897, saw strange doings in various parts of England: ten-foot balloons covered with tinfoil sent up for "capacities" and promptly blown into slivers by the gale; then six-foot calico kites with tin-foil over them and flying tails; finally tailless kites, under the management of experts. In these trials, despite unfavorable conditions, signals were transmitted through space between points over eight miles apart.

In November, 1897, Marconi and Mr. Kemp rigged up a stout mast at the Needles on the Isle of Wight, 120 feet high, and supported a wire from the top by an insulated fastening. Then, having connected the lower end of this wire with a transmitter, they put out to sea in a tugboat, taking with them a receiving-instrument connected to a wire that hung from a sixty-foot mast. Their object was to see at what distance from the Needles they could get signals. For months, through storm and gale, they kept at this work, leaving the Needles farther and farther behind them as details in the instruments were improved, until by the New Year they were able to get signals clear across to the mainland. Forthwith a permanent station was set up there—first at Bournemouth, fourteen miles from the Needles, but subsequently moved to Poole, eighteen miles.

An interesting fact may be noted, that on one occasion, soon after this installation, Mr. Kemp was able to get Bournemouth messages at Swanage, several miles down the coast, by simply lowering a wire from a high cliff and connecting on a receiver at the lower end. Here was communication established with only a rough precipice to serve and no mast at all.

Let us come now to the Kingstown regatta, which took place in July, 1898. and lasted several days. The Daily Express of Dublin set a new fashion in newspaper methods by arranging to have these races observed from a steamer, the Flying Huntress, used as a movable sending-station for Marconi messages which should describe the different events as they happened. A height of from seventy-five to eighty feet of wire was supported from the mast, and this was found sufficient to transmit easily to Kingstown, even when the steamer was twenty-five miles from shore. The receiving-mast erected at Kingstown was 110 feet high, and the despatches as they arrived here through the receiving-instrument were telephoned at once to Dublin, so that the Express was able to print full accounts of the races almost before they were over, and while the yachts were out far beyond the range of any telescope. During the regatta more than 700 of these wireless messages were transmitted.

Not less interesting were the memorable tests that came a few days later, when Marconi was called upon to set up wireless communication between Osborne House, on the Isle of Wight, and the royal yacht, with the Prince of Wales aboard, as she lay off in Cowes Bay. The Queen wished to be able thus to get frequent bulletins in regard to the Prince's injured knee, and not less than 150 messages of a strictly private nature were transmitted, in the course of sixteen days, with entire success. By permission of the Prince of Wales, some

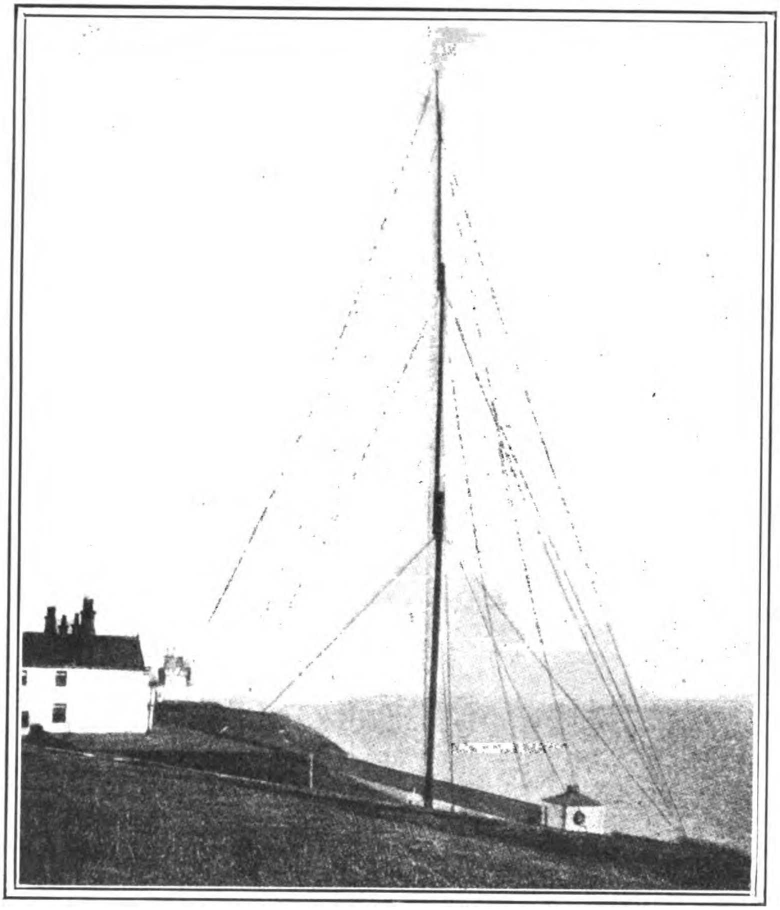
Guglielmo Marconi
From a photograph taken at South Foreland Lighthouse, March 29, 1899

of these messages have been made public; among others the following:

August 4th.
From Dr. Tripp to Sir James Reid.
H. R. H. the Prince of Wales has passed another excellent night and is in very good spirits and health. The knee is most satisfactory.

August 5th.
From Dr. Tripp to Sir James Reid.
H. R. H. the Prince of Wales has passed another excellent night, and the knee is in good condition.

The transmission here was accomplished in the usual way—with a 100-foot pole of Ladywood Cottage, in the grounds at Osborne House, supporting the vertical conductor, and a wire from the yacht's mast lifted eighty-three feet above deck. This wire led down into the saloon, where the instruments were operated and observed with great interest by the various royalties aboard, notably the Duke of York, the Princess



Mast and station at South Foreland, near Dover, England, used by Mr. Marconi in telegraphing without wires across the Channel to Boulogne, France

Louise, and the Prince of Wales himself. What seemed to amaze them above all was that the sending could go on just the same while the yacht was plowing along through the waves. The following was sent on August 10th by the Prince of Wales while the yacht was steaming at a good rate off Benbridge, seven or eight miles from Osborne

To the Duke of Connaught.

Will be pleased to see you on board this afternoon when the "Osborne" returns.

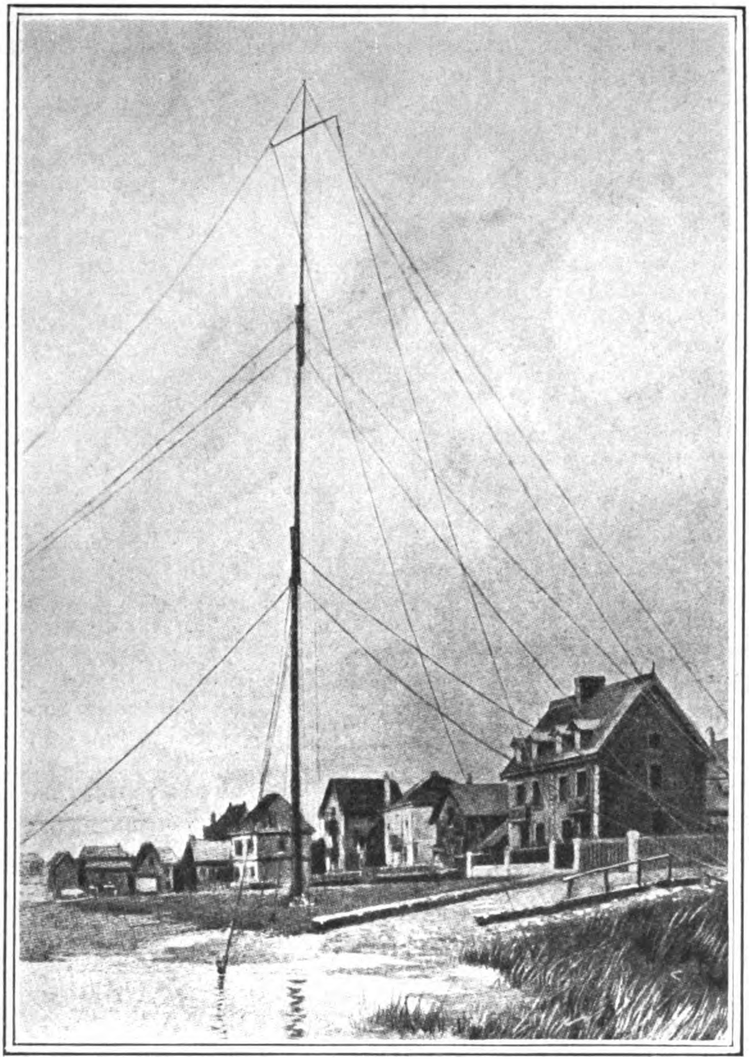
On one occasion the yacht cruised so far west as to bring its receiver within the influence of the transmitter at the Needles, and here it was found possible to communicate successively with that station and with Osborne, and this despite the fact that both stations were cut off from the yacht by considerable hills, one of these, Headon Hill, rising 314 feet higher than the vertical wire on the Osborne.

It was at the extreme west of the Isle of Wight that I got my first practical notion of how this amazing business works. Looking down from the high ground, a furlong beyond the last railway station, I saw at my feet the horseshoe cavern of Alum Bay, a steep semi-circle, bitten out of the chalk cliffs, one might fancy, by some fierce sea-monster, whose teeth had snapped in the effort and been strewn there in the jagged line of Needles. These gleamed up white now out of the waves, and pointed straight across the Channel to the mainland. On the right were low-lying reddish forts, waiting for some enemy to dare their guns. On the left, rising bare and solitary from the highest hill of all, stood the granite cross of Alfred Tennyson, alone, like the man, yet a comfort to weary mariners.

Here, overhanging the bay, is the Needles Hotel, and beside it lifts one of Mr. Marconi's tall masts, with braces and halyards to hold it against storm and gale. From the peak hangs down a line of wire that runs through a window into the little sending-room where we may now see enacted this mystery of talking through the ether. There are

two matter-of-fact young men here who have the air of doing something that is altogether simple. One of them stands at a table with some instruments on it, and works a black-handled key up and down. He is saying something to the Poole station, over yonder in England, eighteen miles away.

"Brripp — brripp — brripp—brrrrrr. Brripp — brripp — brripp—brrrrrr— Brripp — brrrrrr — bripp. Brripp — brripp!"



The mast and station at Boulogne, France, used by Mr. Marconi in telegraphing without wires across the Channel to South Foreland, England

So talks the sender with noise and deliberation. It is the Morse code working — ordinary dots and dashes which can be made into letters and words, as everybody knows. With each movement of the key bluish sparks jump an inch between the two brass knobs of the induction coil, the same kind of coil and the same kind of sparks that are familiar in experiments, with the Röntgen rays. For one dot, a single spark jumps; for one dash, there comes a stream of sparks. One knob of the induction coil is connected with the earth, the other with the wire hanging from the masthead. Each spark indicates a certain oscillating impulse from the electrical battery that actuates the coil; each one of these impulses shoots through the aerial wire, and from the wire through space by oscillations of the ether, traveling at the speed of light, or seven times around the earth in a second. That is all there is in the sending of these Marconi messages.

"I am giving them your message," said the young man presently, "that you will spend the night at Bournemouth and see them in the morning. Anything more?"

"Ask them what sort of weather they are having," said I, thinking of nothing better.

"I've asked them," he said, and then struck a vigorous series of Vs, three dots and a dash, to show that he had finished.

"Now I switch on to the receiver,"

he explained, and connected the aerial wire with an instrument in a metal box about the size of a valise. "You see the aerial wire serves both to send the ether waves out and to collect them as they come through space. Whenever a station is not sending, it is connected to receive."

"Then you can't send and receive at the same time?"

"We don't want to. We listen first, and then talk. There, they're calling us. Hear?"

Inside the metal box a faint clicking sounded, like a whisper after a hearty tone. And the wheels of a Morse printing-apparatus straightway began to turn, registering dots and dashes on a moving tape.

"They send their compliments, and say they will be glad to see you. Ah, here comes the weather: 'Looks like snow. Sun is blazing on us at present.'"

It is worthy of note that, five minutes later, it began to snow on our side of the Channel.

"I must tell you," went on my informant, "why the receiver is put in this metal box. It is to protect it against the influence of the sender, which, you observe, rests beside it on the table. You can easily believe that a receiver sensitive enough to record impulses from a point eighteen miles away might be disorganized if these impulses came from a distance of two or three feet. But the box keeps them out."

"And yet it is a metal box?"

"Ah, but these waves are not conducted as ordinary electric waves are. These are Hertzian waves, and good conductors for every-day electricity may be bad conductors for them. So it is in this case You heard the receiver work just now for the message from Poole, yet it makes no sound while our own sender is going. But look here, I will show you something."

He took up a little buzzer with a tiny battery, such as is used to ring electric bells. "Now listen. You see, there is no connection between this and the receiver." He joined two wires so that the buzzer began to buzz, and instantly the receiver responded, dot for dot, dash for dash.

"There," he said, "you have the whole principle of the thing right before you. The feeble impulses of this buzzer are transmitted to the receiver in the same way that the stronger impulses are transmitted from the induction coil at Poole. Both travel through the ether."

"Why doesn't the metal box stop these feeble impulses as it stops the strong ones of your own sender?"

"It does. The effect of the buzzer is through the aerial wire, not through the box. The wire is connected with the receiver now, but when we are sending, it connects only with the induction coil, and the receiver, being cut off, is not affected.'"

"Then no message can be received when you are sending?"

"Not at the very instant. But, as I said, we always switch back to the receiver as soon as we have sent a message; so another station can always get us in a few minutes. There they are again."

Once more the receiver set up its modest clicking.

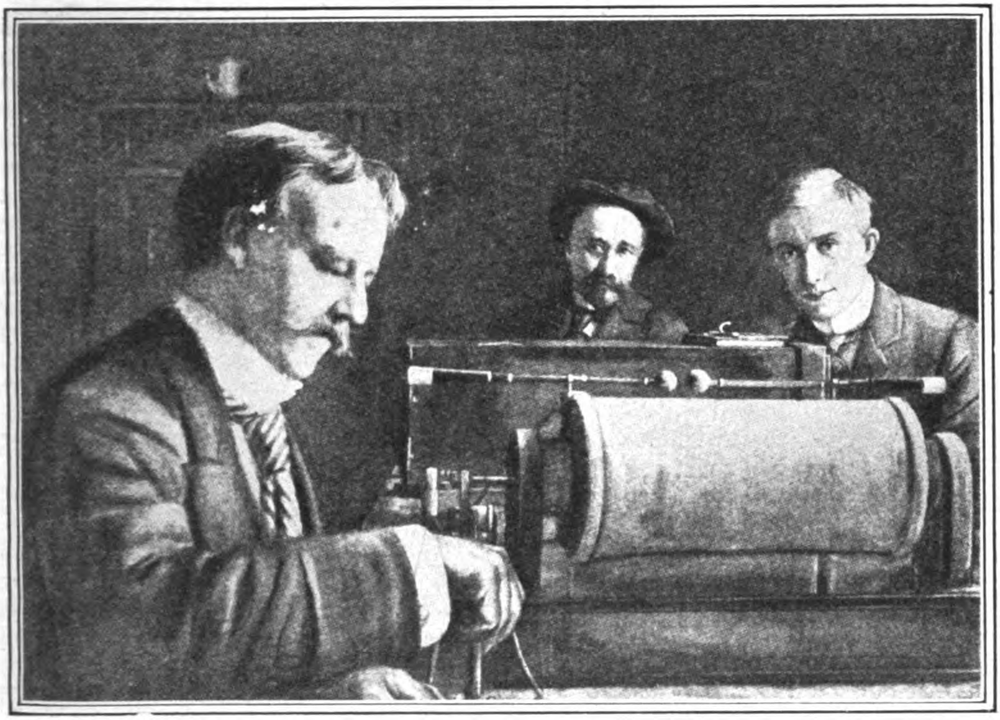
"They're asking about a new coherer we're putting in," he said, and proceeded to send the answer back. I looked out across the water, which was duller now under a gray sky. There was something uncanny in the thought that my young friend here, who seemed as far as possible from a magician or supernatural being, was flinging his words across this waste of sea, over the beating schooners, over the feeding cormorants, to the dim coast of England yonder.

"I suppose what you send is radiated in all directions?"

"Of course."

"Then anyone within an eighteen-mile range might receive it?"

"If they had the proper kind of a receiver." And he smiled complacently, which drew further questions from me, and presently we were discussing the relay and the tapper and the twin silver plugs in the neat vacuum tube, all essential parts of Marconi's instrument for catching these swift pulsations in the ether. The tube is made of glass, about the thickness of a thermometer tube and about two inches long. It seems absurd that so tiny and simple an affair can



Transmitting instrument at Boulogne station
Drawn from a Photograph

come as a boon to ships and armies and a benefit to all mankind; yet the chief virtue of Marconi's invention lies here in this fragile coherer. But for this, induction coils would snap their messages in vain, for none could read them. The silver plugs in this coherer are so close together that the blade of a knife could scarcely pass between them; yet in that narrow slit nestle several hundred minute fragments of nickel and silver, the finest dust, siftings through silk, and these enjoy the strange property (as Marconi discovered) of being alternately very good conductors and very bad conductors for the Hertzian waves—very good conductors when welded together by the passing current into a continuous metal path, very bad conductors when they fall apart under a blow from the tapper. One end of the coherer is connected with the aerial wire, the other with the earth and also with a home battery that works the tapper and the Morse printing instrument.

And the practical operation is this: When the impulse of a single spark comes through the ether down the wire into the coherer, the particles of metal cohere (hence the name), the Morse instrument prints a dot, and the tapper strikes its little hammer against the glass tube. That blow decoheres the particles of metal, and stops the current of the home battery. And each successive impulse through the ether produces the same phenomena of coherence and decoherence, and the same printing of dot or dash. The impulses through the ether would never be strong enough of themselves to work the printing-instrument and the tapper, but they are strong enough to open and close a valve (the metal dust), which lets in or shuts out the stronger current of the home battery—all of which is simple enough after someone has taught the world how to do it.

Twenty-four hours later, after a breezy ride across the Channel on the self-reliant, side-wheeler Lymington, then an hour's railway journey and a carriage jaunt of like duration over gorse-spread sand dunes, I found myself

at the Poole Signal Station, really six miles beyond Poole, on a barren promontory. Here the installation is identical with that at the Needles, only on a larger scale, and here two operators are kept busy at experiments, under the direction of Mr. Marconi himself and Dr. Erskine-Murray, one of the company's chief electricians. With the latter I spent two hours in profitable converse. "I suppose," said I, "this is a fine day for your work?" The sun was shining and the air mild.

"Not particularly," said he. "The fact is, our messages seem to carry best in fog and bad weather. This past winter we have sent through all kinds of gales and storms without a single breakdown."

"Don't thunder-storms interfere with you, or electric disturbances?"

"Not in the least."

"How about the earth's curvature? I suppose that doesn't amount to much just to the Needles?"

"Doesn't it though? Look across, and judge for yourself. It amounts to 100 feet at least. You can only see the head of the Needles lighthouse from here, and that must be 150 feet above the sea. And the big steamers pass there hulls and funnels down."

"Then the earth's curvature makes no difference with your waves?"

"It has made none up to twenty-five miles, which we have covered from a ship to shore; and in that distance the earth's dip amounts to about 500 feet. If the curvature counted against us then, the messages would have passed some hundreds of feet over the receiving-station; but nothing of the sort happened. So we feel reasonably confident that these Hertzian waves follow around smoothly as the earth curves."

"And you can send messages through hills, can you not?"

"Easily. We have done so repeatedly."

"And you can send in all kinds of weather?"

"We can."

"Then," said I after some thought, "if neither land nor sea nor atmospheric conditions can stop you, I don't see why you can't send messages to any distance."

"So we can," said the electrician, "so we can, given a sufficient height of wire. It has become simply a question now how high a mast you are willing to erect. If you double the height of your mast, you can send a message four times as far. If you treble the height of your mast, you can send a message nine times as far. In other words, the law established by our experiments seems to be that the range of distance increases as the square of the mast's height. To start with, you may assume that a wire suspended from an eighty-foot mast will send a message twenty miles. We are doing about that here."

"Then," said I, multiplying, "a mast 160 feet high would send a message eighty miles?"

"Exactly."

"And a mast 320 feet high would send a message 320 miles; a mast 640 feet high would send a message 1,280 miles; and a mast 1,280 feet high would send a message 5,120 miles?"

"That's right. So you see if there were another Eiffel Tower in New York, it would be possible to send messages to Paris through the ether and get answers without ocean cables."

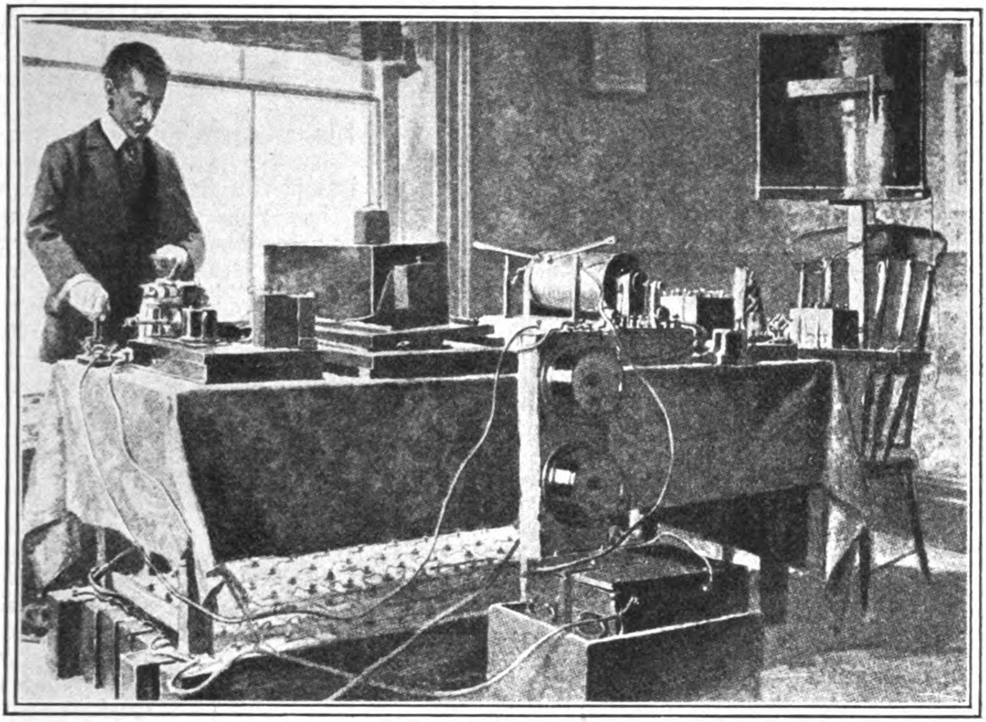
"Do you really think that would be possible?"

"I see no reason to doubt it. What are a few thousand miles to this wonderful ether, which brings us our light every day for millions of miles?"

"Do you use stronger induction coils," I asked, "as you increase the distance of transmission?"

"We have not up to the present, but we may do so when we get into the hundreds of miles. A coil with a ten-inch spark, however, is quite sufficient for any distances under immediate consideration."

After this we talked of improvements in the system made by Mr. Marconi as the result of experiments kept up continuously since these stations were established, nearly two years ago. It was found that a horizontal wire, placed at whatever height, was of practically no value in sending messages; all that counts here is the vertical component. Also that it is better to have the wire conductor suspended out from the mast by a sprit. It was found, furthermore,



The wireless telegraph station at Poole, showing sending and receiving instruments. In the right-hand corner is the copper reflector used in directing the waves
Drawn from a Photograph

that by modifying the coherer and perfecting various details of installation the total efficiency was much increased, so that the vertical conductor could be lowered gradually without disturbing communication. Now they are sending to the Needles with a sixty-foot conductor, whereas at the start a wire with 120 feet vertical height was necessary.

So much for my visits to these pioneer etherial stations (if I may so style them), which gave me a general familiarity with the method of wireless telegraphy and enabled me to question Mr. Marconi with greater pertinence during several talks which it was my privilege to have with him. What interested me chiefly was the practical and immediate application of this new system to the world's affairs. And one thing that came to mind naturally was the question of privacy or secrecy in the transmission of these aerial messages. In time of war, for instance, would communications between battleships or armies be at the mercy of any one, including enemies, who might have a Marconi receiver?

On this point Mr. Marconi had several things to say. In the first place, it was evident that generals and admirals, as well as private individuals, could always protect themselves by sending their despatches in cipher. Then, during active military operations, despatches could often be kept within a friendly radius by lowering the wire on the mast until its transmitting power came within that radius.

Marconi realizes, of course, the desirability of being able in certain cases to transmit messages in one and only one direction. To this end he has conducted a special series of experiments with a sending-apparatus different from that already described. He uses no wire here, but a Righi oscillator placed at the focus of a parabolic copper reflector two or three feet in diameter. The waves sent out by this oscillator are quite different from the others, being only about two feet long, instead of three or four hundred feet, and the results, up to the present, are less important than those obtained with the pendent wire. Still in

trials on the Salisbury Plain, he and his assistants sent messages perfectly in this way over a distance of a mile and three-quarters, and were able to direct these messages at will by aiming the reflector in one direction or another. It appears that these Hertzian waves, though invisible, may be concentrated by parabolic reflectors into parallel beams and projected in narrow lines, just as a bull's-eye lantern projects beams of light. And it was found that a very slight shifting of the reflector would stop the messages at the receiving end. In other words, unless the Hertzian beams fell directly on the receiver, there was an end of all communication.

"Do you think," I asked, "that you will be able to send these directed messages very much farther than you have sent them already?"

"I am sure we shall," said Marconi. "It is simply a matter of experiment and gradual improvement, as was the case with the undirected waves. It is likely, however, that a limit for directed messages will be set by the curvature of the earth. This stops the one kind, but not the other."

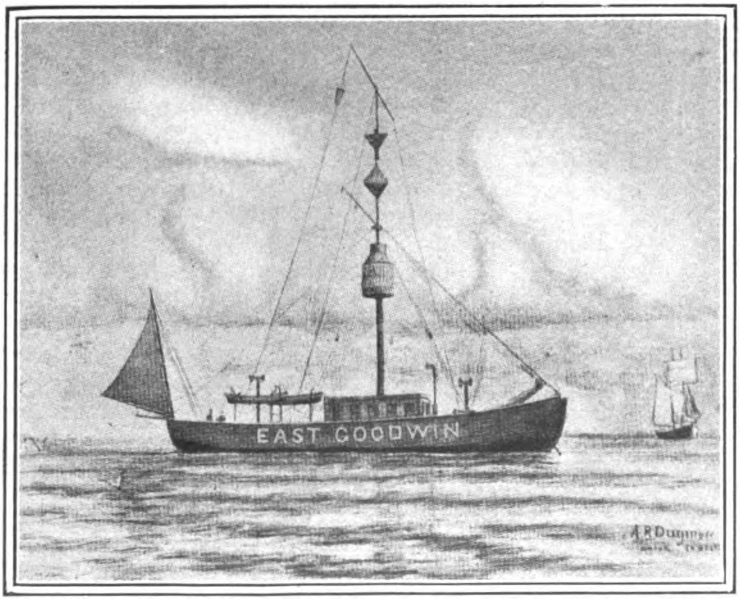
"And what will that limit be?"

"The same as for the heliograph, fifty or sixty miles."

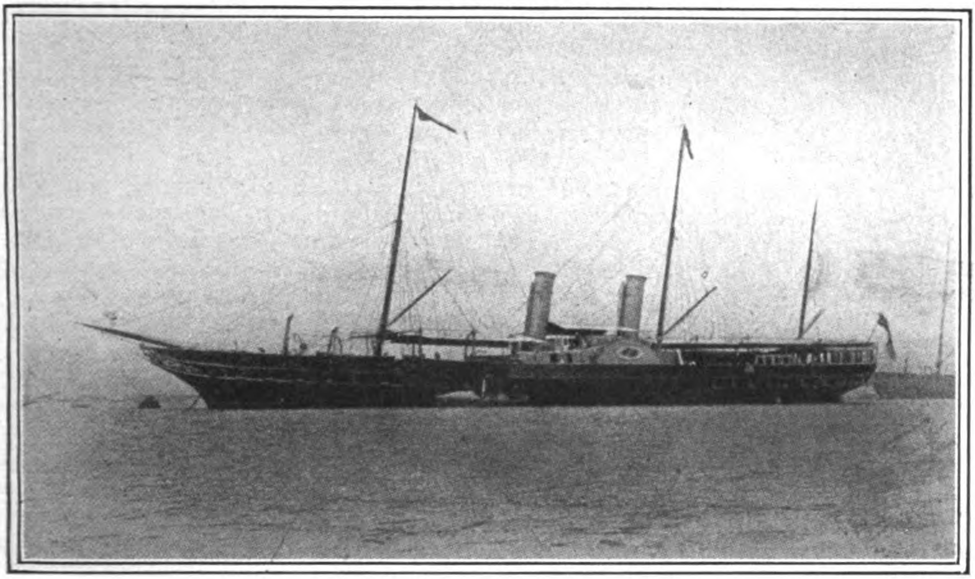
"And for the undirected messages there is no limit?"

"Practically none. We can do a hundred miles already. That only requires a couple of high church steeples or office buildings. New York and Philadelphia, with their skyscraping structures, might talk to each other through the ether whenever they wished to try it. And that is only a beginning. My system allows messages to be sent from one moving train to another moving train or to a fixed point by the tracks; to be sent from one moving vessel to another vessel or to the shore, and from lighthouses or signal stations to vessels in fog or distress."

Marconi pointed out one notable case where his system of sending directed waves might render great service to humanity. Imagine a lighthouse or danger spot in the sea fitted with a transmitter and parabolic reflector, the whole kept turning on an axis and constantly throwing forth impulses in the ether—a series of danger signals, one might call them. It is evident that any vessel fitted with a Marconi receiver would get warning through the ether (say by the automatic ringing of a bell) long before her lookout could see a light or hear any bell or fog-horn. Furthermore, as each receiver gives warning only when its rotating reflector is in one particular position — that is, facing the transmitter—it is evident that the precise location of the alarm station would at once become known to the mariner. In other words, the vessel would immediately get her bearings, which is no small matter in a storm or fog.



The Goodwin Sands Lightship—Struck in a collision on April 28, 1899, the lightship used her Marconi apparatus (shown suspended by a spar from the mast-head), and so got help from shore, twelve miles away, before she sank



The Royal yacht "Osborne" from which the Prince of Wales sent a message

Again, the case of lightships off shore gives the Marconi system admirable opportunity of replacing cables, which are very expensive and in constant danger of breaking. In December, 1898, the English lightship service authorized the establishment of wireless communication between the South Foreland lighthouse at Dover and the East Goodwin lightship, twelve miles distant; and several times already warnings of wrecks and vessels in distress have reached shore when, but for the Marconi signals, nothing of the danger would have been known. One morning in January, for instance, during a week of gales, Mr. Kemp, then stationed at the South Foreland lighthouse, was awakened at five o'clock by the receiver bell, and got word forthwith that a vessel was drifting on the deadly Goodwin Sands, firing rockets as she went. At this moment there was so dense a fog bank between the sands and the shore that the rockets could never have been seen by the coastguards. They were now, however, informed of the crisis by telegraph, and were able to put out at once in their life-boats.

At another time, also in heavy fog, a warning gun sounded from the lightship, and at once the receiver ticked off: "Schooner headed for sands. Are trying to make her turn."

"Has she turned yet?" questioned Kemp.

"No. We've fired another gun."

"Has she turned yet?"

"Not yet. We're going to fire again. There, she turns." And the danger was over without calling on the life-boat men, who might otherwise have labored hours in the surf to save a vessel that needed no saving.

Another application of wireless telegraphy that promises to become important is in the signaling of incoming and outgoing vessels. With Marconi stations all along the coast it would be possible, even as the discovery stands to-day, for all vessels within twenty-five miles of shore to make their presence known and to send or receive communications. So apparent are the advantages of such a system that in May, 1898, Lloyds began negotiations for the setting up of instruments at various Lloyds stations; and a preliminary trial was made between Ballycastle and Rathlin Island in the north of Ireland. The distance signalled over here was seven and a half miles, with a high cliff intervening between the two positions; the results of many trials here were more than satisfactory.

I come now to that historic week at

the end of March, 1899, when the system of wireless telegraphy was put to its most severe test in experiments across the English Channel between Dover and Boulogne. These were undertaken at the request of the French Government, which is considering a purchase of the rights to the invention in France. During the several days that the trials lasted, representatives of the French Government visited both stations, and observed in detail the operations of sending and receiving. Mr. Marconi himself and his chief engineer, Mr. Jameson Davis, explained how the installations had been set up and what they expected to accomplish.

At five o'clock on the afternoon of Monday, March 27th, everything being ready, Marconi pressed the sending-key for the first cross-channel message. There was nothing different in the transmission from the method grown familiar now through months at the Alum Bay and Poole stations. Transmitter and receiver were quite the same; and a seven-strand copper wire, well insulated and hung from the sprit of a mast 150 feet high, was used. The mast stood in the sand just at sea level, with no height of cliff or bank to give aid.

"Brripp — brripp — brrrrr — brripp —brrrrrr," went the transmitter under Marconi's hand. The sparks flashed, and a dozen eyes looked out anxiously upon the sea as it broke fiercely over Napoleon's old fort that rose abandoned in the foreground. Would the message carry all the way to England? Thirty-two miles seemed a long way.

"Brripp — brripp — brrrrrp — brripp —brrrrr—brripp—brripp." So he went, deliberately, with a short message telling them over that he was using a two-centimeter spark, and signing three V's at the end.

Then he stopped, and the room was silent, with a straining of ears for some sound from the receiver. A moment's pause, and then it came briskly, the usual clicking of dots and dashes as the tape rolled off its message. And there it was, short and commonplace enough, yet vastly important, since it was the first wireless message sent from England to the Continent: First "V," the call; then "M," meaning, "Your message is perfect"; then, "Same here 2 c m s. V V V," the last being an abbreviation for two centimeters and the conventional finishing signal.

And so, without more ado, the thing was done. The Frenchmen might stare and chatter as they pleased, here was something come into the world to stay. A pronounced success surely, and everybody said so as messages went back and forth, scores of messages, during the following hours and days, and all correct.

On Wednesday, Mr. Robert McClure and I, by the kindness of Mr. Marconi, were allowed to hold cross-channel conversation, and, in the interests of our readers, satisfy ourselves that this wireless telegraphy marvel had really been accomplished. It was about three o'clock when I reached the Boulogne station (this was really at the little town of Wimereux, about three miles out of Boulogne). Mr. Kemp called up the other side thus: "Moffett arrived. Wishes to send message. Is McClure ready?"

Immediately the receiver clicked off: "Yes, stand by;" which meant that we must wait for the French officials to talk, since they had the right of way. And talk they did, for a good two hours, keeping the sparks flying and the ether agitated with their messages and inquiries. At last, about five o'clock, I was cheered by this service along the tape: "If Moffett is there, tell him McClure is ready." And straightway I handed Mr. Kemp a simple cipher message which I had prepared to test the accuracy of transmission. It ran thus:

McCLURE, DOVER: Gniteerg morf Ecnarf ot Dnalgne hguorht eht rehte. MOFFETT.

Read on the printed page it is easy to see that this is merely, "Greeting from France to England through the ether," each word being spelled backward. For the receiving operator at Dover, however, it was as hopeless a tangle of letters as could have been desired. Therefore was I well pleased when the Boulogne receiver clicked me back the following:

MOFFETT, BOULOGNE: Your message received. It reads all right. Vive Marconi.
McCLURE.

Then I sent this:

MARCONI, DOVER: Hearty congratulations on success of first experiment in sending aërial messages across the English channel. Also best thanks on behalf of editors McClure's Magazine for assistance in preparation of article. MOFFETT.

And got this reply:

MOFFETT, BOLOGNE: The accurate transmission of your messages is absolutely convincing. Good-by. MCCLURE.

Then we clicked back "Good-by," and the trial was over. We were satisfied; yes, more, we were delighted.

I asked one of Marconi's chief engineers if the Boulogne and Dover installation would remain permanent now. He said that depended on the French and English governments. The latter has a monopoly in England on any system of telegraphy in which electric apparatus is used; and all cross-channel cables are of British ownership.

"There must be a great saving by the wireless system over cables," I said.

"Judge for yourself. Every mile of deep-sea cable costs about $750; every mile for the land-ends about $1,000. All that we save, also the great expense of keeping a cable steamer constantly in commission making repairs and laying new lengths. All we need is a couple of masts and a little wire. The wear and tear is practically nothing. The cost of running, simply for home batteries and operators' keep."

"How fast can you transmit messages?"

"Just now at the rate of about fifteen words a minute; but we shall do better than that no doubt with experience. You have seen how clear our tape reads. Any one who knows the Morse code will see that the letters are perfect."

"Do you think there is much field for the Marconi system in overland transmission?"

"In certain cases, yes. For instance, where you can't get the right of way to put up wires and poles. What is a disobliging farmer going to do if you send messages right through his farm, barns and all? Then see the advantage in time of war for quick communication, and no chance that the enemy may cut your wires."

"But they may read your messages."

"That is not so sure, for besides the possibility of directing the waves with reflectors, Marconi is now engaged in most promising experiments in syntony, which I may describe as the electrical tuning of a particular transmitter to a particular receiver, so that the latter will respond to the former and no other, while the former will influence the latter and no other. That, of course, is a possibility in the future, but it bids fair soon to be realized. There are even some who maintain that there may be produced as many separate sets of transmitters and receivers capable of working only together as there are separate sets of Yale locks and keys. In that event, any two private individuals might communicate freely without fear of being understood by others. There are possibilities here, granting a limitless number of distinct tunings for transmitter and receiver, that threaten our whole telephone system. I may add, our whole newspaper system."

"Our newspaper system?"

"Certainly; the news might be ticked off tapes every hour right into the houses of all subscribers who had receiving-instruments tuned to a certain transmitter at the newspaper distributing station. Then the subscribers would have merely to glance over their tapes to learn what was happening in the world."

We talked after this of other possibilities in wireless telegraphy and of the services Marconi's invention may render in coming wars.

"If you care to stray a little into the realm of speculation," said the engineer, "I will point out a rather sensational rôle that our instruments might play in military strategy. Suppose, for instance, you Americans were at war with Spain, and wished to keep close guard over Havana harbor without sending your fleet there. The thing might be done with a single fast cruiser in this way: Supposing a telegraphic cable laid from Key West, or any convenient point on your shores, and ending at the bottom of the sea a few miles out from the harbor. Let us imagine this to have been done without knowledge of the Spaniards. And suppose a Marconi receiving-instrument, properly protected, to be lying there at the bottom in connection with the cable. Now, it is plain that this receiver will be influenced in the usual

way by a Marconi transmitter aboard the cruiser, for the Hertzian waves pass well enough through water. In other words, you can now set the armature of a relay down at the ocean's bottom clicking off Morse signals as fast as you like, and it is a simple matter of electrical adjustment to make that armature repeat these signals automatically over the whole length of cable in the ordinary way.

"With this arrangement, the captain of your cruiser may now converse freely with the admiral of the fleet at Key West or with the President himself at Washington, without so much as quitting his deck. He may report every movement of the Spanish warships as they take place, even while he is following them or being pursued by them. So long as he keeps within twenty or thirty miles of the submerged cable-end, he may continue his communications, may tell of arrivals and departures, of sorties, of loading transports, of filling bunkers with coal, and a hundred other details of practical warfare. In short, this captain and his innocent-looking cruiser may become a never-closing eye for the distant American fleet, an eye fixed continually upon an enemy all unsuspicious of this communication and surveillance. And it needs but little thought to see how easily an enemy at such disadvantage may be taken unawares or be led into betraying important plans."

This conception struck me as so interesting that I pressed my informant to say how far he thought it lay in the realm of speculation.

"Why," said he, "it is a sensible enough little dream that might be realized, if any one cared to spend the money and take the necessary trouble. There is no doubt our instruments could be made to operate a cable at sea-bottom, just as they could be made to blow up a powder magazine in a beleaguered city or steer a ship from a distance, or——"

"Steer a ship from a distance?" I interrupted.

"Certainly, a small one, say a lightship, with no one aboard her."

"How could you steer her?"

"Oh, by a simple arrangement of communtators and relays. It isn't worth while going into the thing, but you could send one signal through the ether that would part her cables, say by an explosive tube or a simple fusing process. Then you could send another signal that would open her throttle-valve and start her engines. Of course, I'm assuming fires up and boilers full. Then you could send other signals that would put her helm to starboard or port and so on. And straightway your lightship would go where you wanted her to. There may not seem to be much sense in steering an empty lightship about, but don't you see the vast usefulness in warfare of such control over certain other craft? Think a moment."

He smiled mysteriously while I thought.

"You mean torpedo craft?"

"Exactly. The warfare of the future will have startling things in it; perhaps the steering of torpedo craft from a distance will be counted in the number. But we may leave the details to those who will work them out."

And here, I think, we may leave this whole fascinating subject, in the hope that we have seen clearly what already is, and with a half discernment what is yet to be.

Chapter X

In line with their policy of progression and development, the Marconi Wireless Telegraph Company of America has recently produced a transmitting unit of the panel type known as the Type E 120-cycle set.

This set is characterized by:

(1) Compactness of design; (2), the attainment of a maximum degree of over-all efficiency; (3), economical operation; (4), effective range of transmission; (5), noiseless operation.

Some of the more detailed features are:

(1) Rapidity with which the set may be changed from one of the standard wave-lengths to the other; (2), the simple and easy means provided for altering the coupling of the transmitter; (3), the use of a primary wattmeter for constant measurement of power input; (4), accessibility to all parts of the equipment for repairs or alterations; (5), the low voltages employed, eliminating losses due to leakage; (6), the provision of spare parts or alternative arrangements in case of breakdown.

A front view of this equipment is shown in the accompanying photograph (Fig. 1), a side view in Figure 2 and a rear view in Figure 3.

While this set has an effective range of transmission suitable for all classes of vessels, it is particularly adaptable to small yachts, cargo vessels, submarines, torpedo boats or vessels of like calibre, where an equipment is required that will occupy a minimum of space and be economical in current consumption.

In many installations the Type E set is used as the main power set. For auxiliary purposes, storage cells—60 in number—are employed, giving sufficient voltage to operate the motor generator independently of the ship's source of direct current supply.

A number of spare parts, such as an extra motor generator armature, motor blower armature, quenched gap plates, condenser jars, etc., are supplied, positively, insuring against all possibility of breakdown. In case of accident to the series gap discharger, a synchronous rotary gap mounted on the end of the motor generator shaft is provided.

In certain installations the Type E set is used as the auxiliary equipment alone. In this case the power set is generally of 2 k. w. capacity.

The Motor Generator

For the use of operators in the Marconi service or others interested, a detailed wiring diagram of this equipment is given in Figure 4 and an explanation follows:

The motor generator is of the Eck type having a two-pole shunt wound motor and a simple shunt field winding for the generator. The speed of the motor is regulated by the sliding contact rheostat, R, and the voltage of the generator altered by the rheostat R^1. The generator field circuit may be broken by the small switch as shown. The receiving apparatus is

thus protected from "humming" noises due to induction from the A. C. generator circuits.

Motor-Starter

This is the Cutler-Hammer single step type. When the main D. C. switch is closed the resistance coil, S, is thrown in series with the D. C. armature. Owing to the absence of counter-electro motive force, the difference of potential across the terminals of the armature at the start of the motor is of small value; hence insufficient current flows through the solenoid winding, W, to draw up the plunger P. As the speed of the armature increases, the counter-electro motive force rises, and accordingly the difference of potential increases until sufficient current flows through the winding, W, to draw up the plunger, P, whereupon the contacts, C, and C^1, are short-circuted, cutting the resistance coil, S, out of the circuit. The motor is now connected directly to the D. C. line.

The plunger, P, also separates the contacts, D and D^1, connecting the resistance coil, S^1, in series with the winding, W, to protect the latter from overheating or burning out.

The Transformer

The transformer is of the closed core type and is denoted by the primary winding, T, and the secondary winding, T^1. Just previous to pressing the key the voltage of the generator is about 300 volts, but immediately drops to a value of about 110 volts when the key is closed. The secondary voltage of the transformer with the condensers in shunt has a value of about 14,700. A safety discharge gap is connected to the secondary winding terminals for the protection of the condensers and transformer in case one of the leads from the regular discharge gap should become disconnected.

The Wattmeter

The wattmeter is of the ordinary switchboard type connected in the circuit as shown. The resistance coil, N, is placed in series with the potential coil of the meter and is mounted at the front and to the base of the switchboard as shown in the photographs.

The Condensers

The condensers are of the tubular Leyden jar type, coated inside and out-

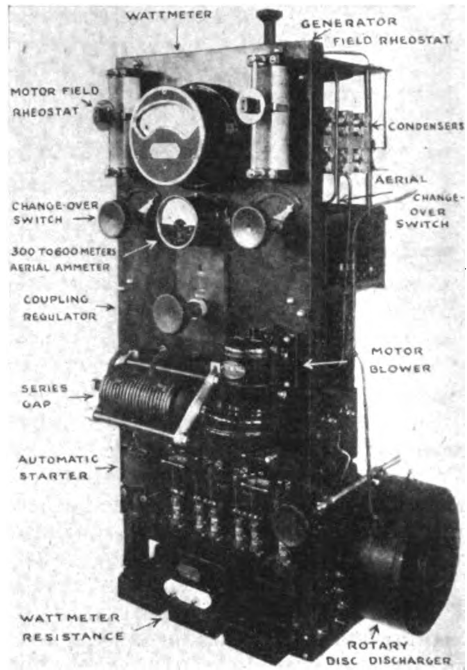


Fig. 1

side with copper. The average value of capacity of each jar is about 0.0015 Mfds. The actual value is accurately measured and marked directly on the glass. In case of puncture a condenser jar of equivalent value must be substituted. Seven Leyden jars in parallel are used, giving a total capacity of about 0.011 Mfds. The inside and outside terminals of the Leyden jars are connected directly to the secondary winding of the transformer.

The Oscillation Transformer

The oscillation transformer consists of a primary and secondary winding of the pancake type. These are indicated at L and L^1, respectively. Each winding consists of a single spiral of copper ribbon properly mounted and spaced on an insulated base.

The secondary winding, L^1, is on a movable base, so that the coupling between it and the primary winding, L, may be quickly and readily adjusted.

Change-Over Switch

The change-over switch operated by the handle, H, has two single blade contacts which, when thrown to the right simultaneously, connect such values of inductance in the antenna and closed oscillatory circuits as to give each circuit a period of exactly 600 meters. When thrown to the left both circuits are given a wave-length of 300 meters, provided the short-circuiting switch of the short wave condenser, X, is opened.

The proper values of inductance for the 300 and 600-meter waves in the primary winding are selected by trial through the means of a wave-meter and proper connection therefore made through the flexible connectors, E and E^1. The same statement applies to the secondary winding, L^1, where two values of inductance for the standard wave-lengths are obtained through the flexible connectors, F and F^1.

The Stationary Spark Gap

The spark discharger, Q, is of the multiple plate series type, consisting of 15 plates giving 14 gaps. No more than 8 of these are generally required, leaving a number of spares. The discs for this gap are of copper carefully ground, presenting an absolutely smooth and uniform surface. The plates are separated by specially treated fibre washers. Cooling is affected by means of the small direct current blower, J. This circuit also includes a switch for starting and stopping purposes.

The synchronous rotary gap discharger, Y, is mounted on the end of the motor generator shaft. The rotating member has 6 discharge electrodes, while the stationary electrodes are 2 in number. The stationary electrodes may be shifted, causing the spark to discharge at the peak of the condenser voltage. Thus a discharge of uniform intensity having musical characteristics is produced. The group frequency of this set is 240 sparks per second.

The Aerial Tuning Inductance

The aerial tuning inductance is of the continuously variable type and is represented at L^2. It is connected in series with the earth lead and consists of a single spiral of copper ribbon having a sliding contact, U, which allows connection to be made at any point on the spiral.

The Aerial Change-Over Switch

The aerial switch for shifting the antenna from the sending to the receiving apparatus consists of a single blade double throw switch. When thrown to the right the antenna is connected directly to the terminals of the receiving tuner; when thrown to the left connection is made direct to the secondary winding of the transmitting oscillation transformer.

The Aerial Meter

The aerial meter is of the Roller Smith hot-wire type having a range of

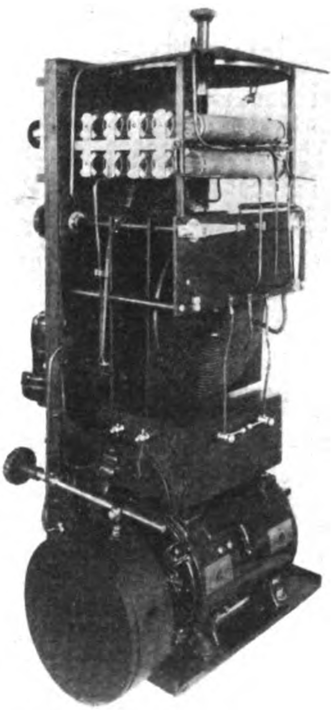


Fig. 2

10 amperes. It is permanently connected in the aerial circuit and is used for obtaining the maximum value of current in the antenna circuit and to indicate resonance.

Short Wave Condenser

This condenser is of the standard Marconi type, consisting of four flat glass plates connected in series and giving a resultant capacity of 0.0005 Mfds.

Protective Condensers

The low potential power circuits are protected from the electrostatic induction by condensers of large capacity. Two of these condensers are connected in series and earthed at the middle point. These protective units are connected across the generator field winding, the motor field winding, the armature of the blower motor and the alternating current armature.

As a guide for placing this set in commercial working order, the following general instructions should be carefully studied by all operators:

Connect the D. C. line (110-120 volts) to the lower terminal of the fused switch marked "D. C. line," the aerial to the binding post marked "A" on the back end of the antenna switch and ground either one or both of the terminals on the iron frame which supports the panel.

The slider of the generator field rheostat should be placed near the lower end of the rheostat, the antenna switch turned to "send" position and about 9 gaps connected in.

See that none of the leads between the double 2-point wave-length switch and the oscillation transformer are disconnected. Close the D. C. line switch which starts the motor generator through the automatic starter. Then close the "generator field" and "blower motor" switch; finally, close the "A. C. line" switch.

The set is now ready for tuning. Disconnect the antenna and tune the closed oscillatory circuit to the two desired wave-lengths by means of a wave-meter.

Set the 2-point switch indicator at "300."

Adjust the taps leading from front coil of oscillation transformer to switch point marked "300," to 300-meter wave-length. Then turn the indicator to "600" and adjust the taps to the higher wave length.

Next connect the set with the antenna, tune the secondary or open circuit to the closed circuit and locate taps for each of the two desired wave-lengths.

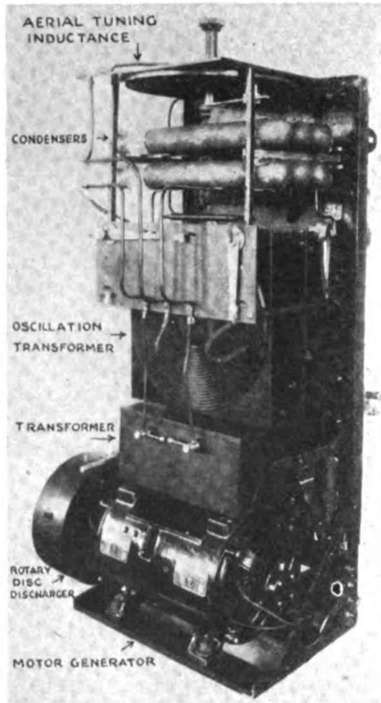


Fig. 3

The coupling, as well as the sliding contact, which travels over the turns of the aerial tuning inductance, should be varied while locating the wave-length taps to find the best position of both the coupling and flexible connection. The circuits are in resonance when the radiation ammeter shows maximum reading. With the average ship's aerial such values of inductance may be located generally in the antenna circuit at the secondary winding of the oscillation transformer, allowing the period of that circuit to be changed from 600 meters to 300 meters by simply throwing the change-over switch to the proper position. In the 300-meter position the short wave condenser, which is placed in series with the earth lead, must have its short-circuiting strap removed. Generally speaking, the aerial tuning inductance

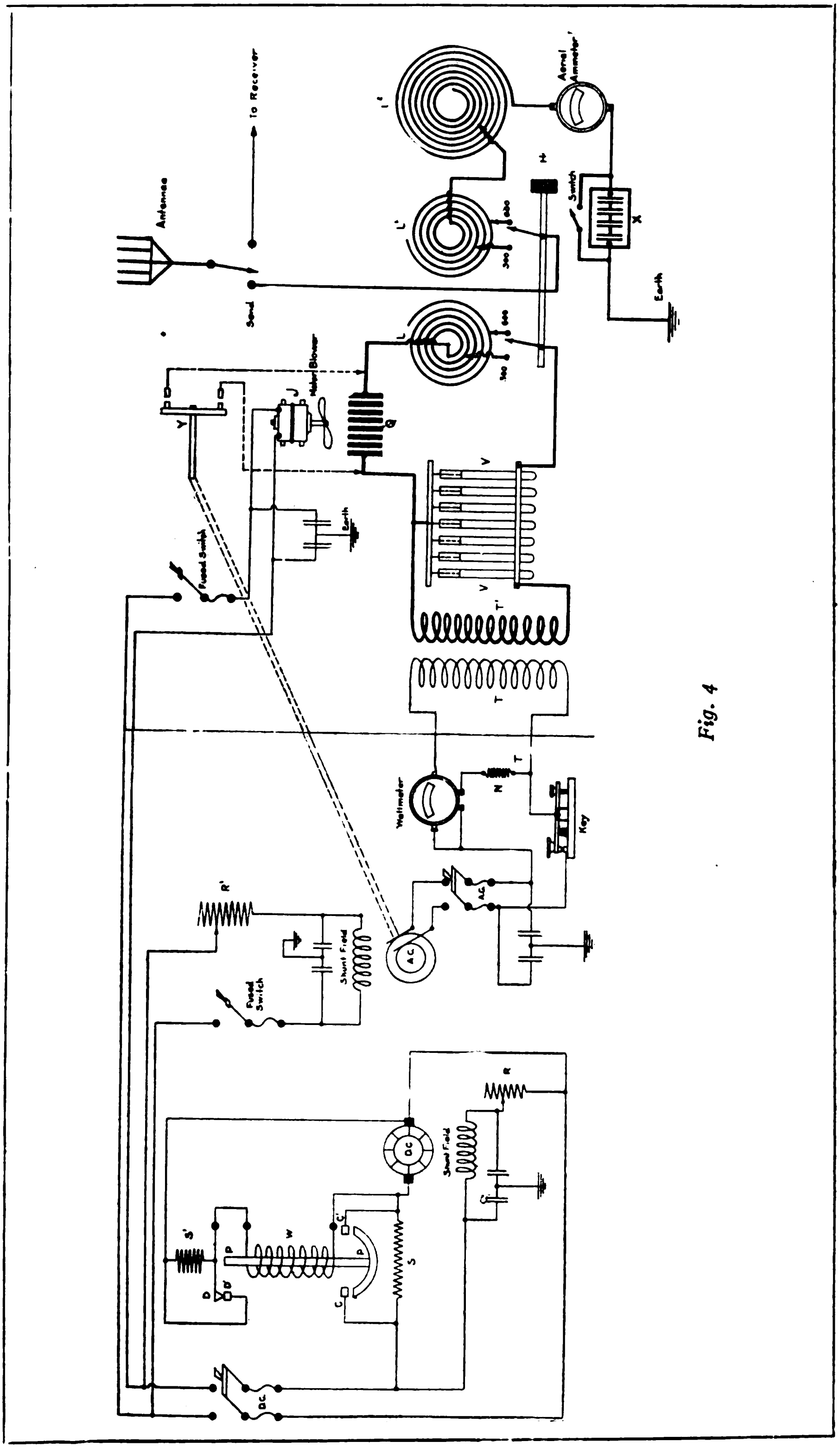

Antennae
To Receiver
Send
Aerial Ammeter
Switch
X
Earth
Motor Blower
J
Q
Y
L
L'
L''
V
V
T'
T
Fused Switch
Earth
Wattmeter
N
T
Key
A.C.
R'
Fused Switch
Shunt Field
A.C.
R
D.C.
Shunt Field
S'
W
S
D.C.

Fig. 4

is placed at some definite point for the 600-meter wave, making it unnecessary to alter the value for a wavelength of 300 meters.

Either a receiver or a wave-meter may be used to indicate the quality of the note. If the note is not clear, vary the generator voltage, number of gaps and transformer coupling, until it is clear and has a pitch of about 240 sparks per second. If the generator voltage is too high or too low, the note will either be rough, or else have the wrong pitch. The note may also be judged by the notes from the brush discharge of the condensers.

Maximum radiation does not indicate maximum efficiency of the gap. The note must be kept clear and the gap not worked above the radiation at which the clearness is not maintained.

The wattmeter should indicate about 500 watts and the number of gaps used should be between 8 and 12.

The power of the set varies as the square of the number of gaps; that is, if the 10 gaps represent full power, the power would be: $10^2 = 100$.

The set is designed to carry a load of *500 watts*. Any overload is liable to develop voltages that may break down the condensers or cause trouble elsewhere.

The series spark gap should not be taken apart until absolutely necessary. When the circuits are in resonance, but the radiation is below normal (5-7 Amps.), or the wattmeter reading falls below its usual value or when unable to get a clear note, the gap should be opened and the sparking surfaces examined.

If a gap becomes short circuited, it can be determined by the use of the "gap tester" (an insulated rod having a brass piece inserted in one end), which will indicate no spark when bridged across two adjacent spark discs.

To open the gap, loosen the set screw in the left end of the gap with a wrench which is supplied with the set. Then lift out the plates.

If the plates and gaskets stick together take care when forcing them apart not to injure the gasket or sparking surfaces. Should the gasket become injured or cling to the metal, clean the plate off carefully and insert the new gasket.

The sparking surface of the plates should have a light pink color with a somewhat dull finish. If a plate has a rough black appearance it indicates that the gap was not air-tight and the sparking surfaces should be carefully cleaned with very fine emery cloth.

If a pair of plates have partly pink and partly black surfaces, it indicates that this particular gap has not been used long enough to consume the air that was between the plates at the start. Free plates and gaskets from dust by wiping them with a clean cloth before reassembling. Screw them together tightly so that the gap will be air-tight, but take care when doing so not to rupture the end casting. Do not operate the set unless the blower-motor of the gap is running, otherwise the plates will heat and destroy the gaskets. *Never touch any circuit which may be alive,* without first opening the field switch, or the generator main switch, or preferably both.

TELEGRAPHERS' TOURNAMENT.

A committee, composed of representatives of both telegraph companies together with representatives from the various railroads, press associations and brokerage firms, has been organized at San Francisco for the purpose of promoting a telegrapher's tournament to be held in the Exposition city during the World's Fair. The exact date has not as yet been decided upon. More details will appear in subsequent issues. It is the plan, however, to conduct it along the same lines which made the Boston tournament a success.

The organization is known as the Panama Pacific International Telegrapher's Tournament Association with E. Cox, chief operator for the Postal Telegraph-Cable Company at San Francisco, as chairman.

Comment and Criticism

The following communication has been received:

I read with interest the data given in the Comment and Criticism department relative to curious facts about detectors, etc. I use principally a galena detector and find that one station will grow faint while another will remain steady and clear, but I have another problem which I would like solved.

At times when I try to copy signals from NAD (the Charleston Navy Yard) I have to tune several points more on the inductance of my receiving tuner than at other times—that is to say, every time I change the adjustment of the detector I must change the wave-length for the best results. For example: This evening I heard WBF (Boston) sending and in order to tune the signals in to the best possible strength I placed the switch on the fourth point of the primary inductance, but after switching over to silicon I received the best signals on the second point. The same results were obtained from a certain ship.

If you will explain this phenomenon in your magazine I shall be very grateful, and if other amateurs have experienced this difficulty I should like to hear from them. H. C. R., New York.

Lacking a diagram of the connections employed by our correspondent, we are not able to give definite advice, but with various adjustments on the crystal different values of resistance are obtained and if the crystal detector is in shunt to a variable condenser, the constants of the closed oscillatory circuit are changed. Whether this change will increase or decrease the wave-length depends upon the constants of all associated apparatus.

The conditions are these: We have a rectifying crystal detector in series with a head telephone, both being shunted to the capacity and inductance of the closed oscillatory circuit. The telephones have resistance, inductance and distributed capacity, representing as the whole a rather complicated circuit which is enhanced by the presence of the crystal rectifier in series. We see that under some conditions this combination may raise the wave-length and under other conditions lower it. The whole matter requires laboratory investigation over an extended period. However, the results would have little practical value. The effects have been noted for some time, but may be quickly compensated for by slight changes in the value of inductance employed or by a shift of the value of coupling.

Perhaps, however, our correspondent used no variable condenser in shunt to the secondary winding of the receiving tuner, but simply shunted a fixed condenser across the head telephones, which in turn was placed in series with the crystal detector. Under these conditions a decrease in resistance such as may be had at certain adjustments of the detector will cause the fixed stopping condenser to become active and play its part in the closed oscillatory circuit. When the contact on the detector is such that the resistance value is high the fixed condenser simply increases the intensity of the energy supplied to the head telephones, while if the adjustment of the detector is again changed so that a lower value of resistance is obtained this fixed condenser becomes a part of the closed oscillatory circuit—that is to say, it becomes active in connection with the inductance, giving that circuit a definite period of a different value.

* * *

A western correspondent thoroughly believes in the value of horseshoe magnets for increasing the sensitiveness of the audion detector. He writes:

I have noticed quite a few articles of late in reference to the use of horseshoe magnets with an audion. I find that if the magnets are properly arranged the experiment is certainly worth while. In the first place the audion stand should be of the type that is mounted on the top of the base instead of the side so as to permit the use of two magnets. If the audion is of the type sold by Arnold, a box of wood or other material can be placed behind the audion so that the top surface is even with the lower part of the bulb. The other magnet may be held by a book placed directly over the binding post at the front.

The book should be at least two inches in thickness. The magnets may be obtained from any telephone company. They should be wide enough to straddle the bulb and not

too strong. The rheostat can generally be adjusted to one place and need not be changed very often. The rear magnet can also be left stationary when once adjusted, but the magnet in front must be changed for each station.

It will be found that the stations can be easily tuned in or out by the use of this magnet alone and the pitch note of certain stations can also be changed. I have found that short wave-lengths work best with very loose coupling, while long wave-lengths are best with tight coupling. It might be well to say that the magnets should be connected with a flexible wire and that the metal stand on which the audion is mounted should be electrically connected to this wire. On some sets it is best to ground the wire. If this is done it will cut out considerable noise due to induction. The wire may be connected to the magnets with a clip from an ordinary 15-ampere switch. R. B., Iowa.

This subject has been discussed in previous issues of THE WIRELESS AGE and there is no doubt that under certain conditions the degree of sensitiveness of some audion bulbs, is considerably improved by the application of magnets. A method for mounting the magnets in order to obtain the best results was shown in the May, 1914, issue of THE WIRELESS AGE, by one of our correspondents. While R. B. has found that short wave-lengths are received best with loose coupling and long wave-lengths with tight coupling, this rule does not necessarily hold good with all apparatus.

It would be necessary for us to know the design of R. B.'s receiving apparatus in order to comment on it, but we believe that it is a matter of design only. Perhaps the values of mutual inductance were no greater with the shorter wave-lengths than with the longer.

* * *

P. B., Ohio, says:

I note in the November issue of THE WIRELESS AGE in answer to the query of H. F., Lancaster, Pa., that you state that no articles have been published on the Marconi Multiple Tuner. You will find that there was an article published on page 163 of the January, 1913, issue of The Marconigraph.

We might have been a little more explicit in our reply to this query, but H. F. requested data as to the actual diameter of the windings, size of the wire, capacity of the condenser, etc. This information is not available for publication and this is what we intended to make plain in our reply.

Another correspondent has noted our comment in the previous issues relative to the fading of wireless signals. We did not mean to state that the swinging in and out of signals is always due to bad detector adjustment, but when a readjustment of the detector brings the signals back to their original strength we cannot believe but that the trouble was due to a change of adjustment at the crystal. We, too, are quite aware that there are causes external to either the transmitting or receiving station, which produce a weakening of the signals.

He writes:

I have been much interested of late in the articles on the fading or swinging out of wireless signals that have appeared from time to time in Comment and Criticism. In the November issue of THE WIRELESS AGE, W. K. W. says that while listening to a station the intensity of the signals die and upon working the buzzer test the signals return to their former state. You gave as a reason for this that the detector must have been poorly adjusted. I have had an experience of a similar nature, except that while the signals from one station would be growing weaker the signals from another station sending at the same time remained the same. On working the buzzer test, however, the intensity of the first increased whereas that of the second remained constant. If you will explain this or refer me to some article on the subject I shall consider it a favor. M. D. C., Massachusetts.

We have often observed when testing crystalline detectors that stations having different sparks or group frequencies require quite different adjustments for the best signals at our receiving station. Just why this is necessary we are unable to state and we do not believe that the matter has been experimentally investigated.

With the object of relaying messages up and down the Columbia river, the Columbia River Wireless Association has been formed. The following officers have been elected: president, F. Mayer, of Dallas, Ore.; secretary, G. Stanley, of Vancouver Carracks, Wash.; chief operator, E. Swan, of Portland, Ore. An invitation has been extended to amateur wireless operators living along the Columbia river to join the organization.

IN THE SERVICE

CONTINENT-TO-CONTINENT DIVISION

When Joel Earl Hudson, superintendent of the Massachusetts-Norway link, with headquarters at Marion, Mass., was an electrician in the United States Navy he was detailed on the repair ship Panther. During target practice in Chesapeake Bay, some years ago, the Panther was acting as "spot" ship, being anchored about 400 yards from the antiquated Texas, the mark for the shells fired from the warship New Hampshire. The first shell struck the water about 400 yards abreast of the Panther and, after ricochetting, came whistling over her bow hardly 100 feet above the heads of the men on deck. The second shell came even closer to the Panther. A disaster might have been the result of discharging the third shell if the commander of the cruiser Chester —another "spot" ship—which was nearby, had not sent an order by wireless to "cease firing."

Thus Hudson received a practical illustration of the worth of wireless.

He was born in Batavia, N. Y., and learned telegraphy there in 1904, while employed by the Western Union Company as a messenger. Subsequently he became interested in electricity and this lead to his enlisting in the United States Navy. He remained eight months in the Naval Electrical School in the Brooklyn Navy Yard and was then offered the choice of entering the wireless department or the dynamo room. The former, it seemed to Hudson, was the more attractive and after he had been graduated he followed his natural bent. He was detailed at the testing station in the Brooklyn Navy Yard and was afterward transferred to the Panther.

Hudson came from the Navy to the Marconi service, entering the construction department in Cliff street, New York City. There he made himself felt to such an extent that he was selected as one of the party of engineers which visited England to receive instruction in high-power work. On his return to this country he was made a Marconi inspector in New York, his duties consisting of visiting ships and examining their wireless apparatus. He served as inspector for about a year and was then detailed at the Belmar station where he was placed in charge of the installing and testing of the receiving apparatus.

Some of the features which will be under Hudson's watchful eyes at Chatham—the receiving station—will be six tall steel masts and a balancing aerial. Then, too, there will be thirty-five operators who will be divided into shifts so that there will be men on duty both during the day and night. At Marion—the transmitting station—there will be a power house for changing in form the current used to transmit messages to Norway and an emergency operating building.

"I am intensely interested in everything connected with wireless," said Hudson, "and my experience at the New Jersey station has induced me to believe that further experiments in the art are sure to open up a way to annihilate distance with less power and far less complicated apparatus."

THE MARCONI COMPANY ESTABLISHES LIBRARIES

The Marconi Wireless Telegraph Company of America has established libraries at its various high power stations for the benefit of its employees. Handsome oak cases have been provided for the books, which will be circulated from station to station.

The book-plate

Fifty volumes have been given by Edward B. Pillsbury, general superintendent of the trans-oceanic division. They include works of Shakespeare, Poe, Dumas and Dickens.

Books on general subjects as well as works of fiction will be found in the libraries. The book-plate to be used was designed by Miss Thalia N. Brown, of the Marconi Company.

Provident Club Distributes Profits

It is reported that close to one hundred Marconi employees participated in the distribution of the funds of the Yearly Provident Club on December 12. While no interest was guaranteed to members at the inauguration of the fund, interest and profits earned during the fifty weeks of its existence amounted to $104.86, allowing each membership approximately 6 per cent. interest. This was distributed in cash, each participant receiving $26.48 for the $25.50 he had deposited in weekly payments throughout the year.

The committee reports that the total number of memberships reached 392 and the total deposits $4,760.66. There were 250 withdrawals during the year and 35 delinquent memberships. The balance of memberships remained at 107 with deposits of $2,728.50 and interest earned $104.86, which amount was distributed in cash immediately after the last payments were made by members.

The name, Yearly Provident Club, is to be changed to Radio Provident Club and the date of final payment will fall on November 27, 1915. The plan of depositing has also been changed and in place of paying 2 cents the first week, 4 cents the second week, 6 cents the third, 8 cents the fourth and so on up to a dollar on the fiftieth week, the 1915 club calls for 50 cents each week throughout the term, the amount thus accumulated aggregating $25, as before.

Payments began with the week ending December 19, 1914.

It is expected that payments will be met promptly when due, and no notices will be sent to delinquent members. All amounts which may be accumulated will be returned to a delinquent member on request, without interest. Members who are thirty days in arrears will be assessed at the rate of 10 cents per week, per share. Membership will lapse after delinquency has continued for two months, and in such cases assessments will not be levied.

Loans will be made to non-members only upon the endorsement of a member in good standing. Any member requesting or endorsing a loan must be in good standing.

The minimum loan to anyone will be $5, the maximum $15. Any amount in excess of this is to be approved by the majority of the members of the committee.

The maximum number of loans that may be made to any one member is 12; beyond this number the approval must be obtained of the majority of the members of the committee.

Weekly payments are to be remitted to Miss Thalia N. Brown, who will continue to act as trustee of the fund, the investment of which will be in the hands of the committee, to whom applications for loans are to be made.

WIRELESS WAR STRATEGY

An unconventional portrait of John Albert Hartley

This young operator tells how he has been under fire

Some Stirring Examples of How the Vessels of the Warring Nations Employ Wireless in Naval Warfare

THE fame of the destroyed German cruiser Emden and Captain von Muller, her commander, has been added to by the story told by John Albert Hartley, a young Marconi operator on the British freight steamship City of Corinth, which arrived in New York recently. It was Hartley's fortune to undergo a memorable experience while on his way to Calcutta, India, on the steamship Chupra to begin his maiden voyage as an operator on the City of Corinth—in fact, to meet with an adventure of the sort which the majority of the men in the service have yet to figure in.

It does not fall to the lot of every wireless man to be close enough to the Emden to hear the awesome music of her shells as they shoot over the waters and to know that the terror of the seas, as the German cruiser was called, is firing on the ship on which he is detailed. Therefore, the tales of how the Emden worked havoc among her foes and the stories of the chivalry and courtesy of her commander have added interest, because they are related by one who has been a target for her guns.

The Chupra had arrived as far as Madras, India, on her way to Calcutta when she ran across the path of the Emden. The German cruiser slipped into the harbor in which the Chupra was anchored under the cover of darkness. Her appearance was totally unexpected as Captain von Muller had doubtless planned it to be. The daring of his exploit can be better appreciated when it is realized that the British cruisers the Black Prince and the Hampshire and two Japanese cruisers were scouring the harbor along the coast with the object of putting an end to the rover's depredations.

It was half past eight o'clock in the evening when the Emden, with all of her

lights concealed, successfully ran the gauntlet of the craft guarding the mouth of the harbor and hovered a mile off the Madras water front. Once in the harbor and ready for action, there was no further need for concealment and she swung her searchlights about so that their rays struck the decks of the Chupra.

Almost simultaneously with the display of the lights came the roar of the Emden's guns. She fired three times, each of the shots striking the Chupra which was flying the British flag. Hartley said that the first shell passed through the forward bulwarks of the English craft, "making quite a mess of things." The second, which exploded amidships in the midst of a group of officers and cadets, killed one of the men and seriously wounded another. The third shell wrecked the bridge and the cabin of the ship's captain.

"By this time," said Hartley, "the searchlights had been turned upon some oil tanks, three of which were set ablaze by the shells from the Emden. It was evident that the oil tanks and the inland lighthouse were all that the German ship's commander had in mind to destroy. It would have been a comparatively easy matter for him to have demolished the entire water front with his heavy guns, but the shells which were fired exploded in some sheds without harming any one. The lighthouse was soon darkened, however.

"The blaze from the burning tanks lighted up the harbor as plainly as if the waters were provided with electric lights, showing up the five British ships in the bay as excellent targets for the Emden's guns. The German commander ignored this opportunity for destruction, however, and, after firing thirty-five shots in fifteen minutes, the Emden scurried out of the harbor as quickly as she had entered it. Three shots were fired at her from the harbor fortifications, but they struck nothing."

The next day Hartley went ashore. In Madras he found indescribable confusion and panic, due to the fact that the greater number of the residents were panic stricken because they believed that the Emden would return and destroy the town. They fled in all kinds of nondescript conveyances, one popular method of putting as many miles of space as possible between them and the dreaded German craft being a two-wheeled cart drawn by oxen. The owners of the vehicles were quick to realize the opportunity to drive hard bargains and in many cases exorbitant prices were paid for the privilege of getting out of the town.

The commander of the Chupra remained at Madras for three days, not venturing to steam outside the harbor because of the fact that the Emden was thought to be nearby. But he finally became impatient and departed for Calcutta, reaching there in safety. It was learned later that he had little to fear from the German ship at that time because she was occupied in capturing five British steamships, the Lovat, the Diplomat, the Kilin, the Indus and the Clan Matheson.

On the arrival of the Chupra in Calcutta, Hartley learned more of the Emden and the havoc she had caused on the seas. While he was in that city he happened upon G. W. Ingle, who was wireless operator on the Indus. The Indus was sent to the bottom by the Emden's men who placed dynamite bombs in her hold after taking off her men and that part of her cargo which they desired.

Ingle lifted the mystery which had long surrounded the Emden because of her success in safely navigating deep and shallow waters, her officers always seeming to have better knowledge of the channels than the men on the craft which were pursuing her. He said that the Emden's feats of navigation were due to the fact that Captain von Muller had as his chief, a veteran seaman—Captain Geisler—who was for a long time navigator of the ships of the Hansa line. Captain Geisler has the reputation of knowing the waters of the Indian Ocean, the Bay of Bengal and the adjacent ship lanes better than any man who sails them. His knowledge of the coast and the short cuts to safety when the German rover was hard pressed by

her pursuers was her salvation on more than one occasion.

It was by means of wireless, Ingle declared, that the Emden trapped the twenty or more British ships which she captured or sank. The German ship cruised about here and there with no definite destination in view. Her operators, however, were constantly listening in and communicating with other craft. When a British vessel answered their calls they asked for her position. The English craft gave it and then the Emden steamed toward her, sure that she had another victim.

When the Emden captured the Indus, the crew of the latter were placed on board the collier accompanying the German cruiser. The members of the crews of the Lovat, the Kilin, the Diplomat and the Clan Matheson were afterward placed on the collier, these vessels having been captured by the Emden. The men taken from the British craft were loud in their praise of the Emden's commander. He is quoted by the men whose lives he had spared as saying, "We must conserve and spare human life whenever that is possible." He was considerably exasperated when he found that the officers of the English craft were sleeping on the decks of the Emden and the collier, while the officers of the German ship were occupying comfortable berths in their cabins. Because of this he publicly reprimanded his officers and afterward the British prisoners occupied bunks, the German officers sleeping on deck.

The grim realities of the Emden's cruise were occasionally relieved by humorous incidents. When the German ship overhauled the Lovat the men of the former and her consort, the Markommania, had been without soap for three days. Their jubilation was great therefore when they found on the Lovat a considerable quantity of soap which was consigned to a firm in Calcutta. And indeed they were in need of soap, for their faces were black with the coal dust which had gathered upon them in shoveling many tons of coal from a captured ship. The Lovat's crew on reaching Calcutta, their lives having been spared, went to the firm to which the soap had been consigned and told of how it had been seized by the Germans. The consignees, however, had been fully informed of the incident, for Captain von Muller had sent them a wireless message thanking them for the soap and apologizing for its seizure. He explained that the circumstances made it absolutely necessary to confiscate the shipment.

Mawse, first mate of the Clan Matheson, said that when that vessel fell into the clutches of the Emden the German cruiser and the Markommania were unloading coal from the Greek collier Pantoporos. The Emden fired two shots at the Clan Matheson and the latter came to a stop. The Clan Matheson's people were transferred to the Markommania where they received extremely courteous treatment. The Lascars from the Clan Matheson's crew were used to transfer coal from the Greek collier, but they were paid double wages, the Germans apologizing for the necessity for employing them.

The capture of the Kabinga was marked by interesting circumstances. She was about 250 miles from Calcutta, steaming through a thick mist, when the Emden suddenly appeared out of the haze. Those on the Kabinga were made forcibly aware of her proximity by two shots fired from her guns. Then came a wireless message directing her to reduce her speed, supplemented by this warning:

"Don't use your wireless."

The wife of the captain of the Kabinga was aboard the captured vessel, and this, according to the stories told to Hartley, induced Captain von Muller to relinquish his claim to the prize. However, he determined to use her by transferring to her the crews of the vessels he had sunk.

One of the new uses to which wireless has been put is its employment by the warring nations to spread information concerning the progress of the conflict. With the cutting of the German-owned Atlantic cables came an end to the communication of Germany with the outside world except by means of wireless. That country, however, saw the advantage of keeping her side of the great war before the eyes of a neutral nation and, with this idea in view, the German high-power stations began sending out news which was intended for the United States and the German colonies. The information was picked up, however, by various wireless stations in different countries everywhere within the range of the stations, which extends from Germany to the American shores of the Atlantic. The bulletins sent out by the Germans were picked up in England by the Marconi stations and given to the newspapers in that country after they had been officially censored.

The Allies are also using wireless to convey their viewpoint to the world at large. In France, military and political bulletins are being sent out from the Eiffel Tower. British bulletins written by the War Office are being sent out by the Marconi Company.

Wireless messages said to have been picked up by operators on vessels which recently reached ports of the United States indicate that the German cruiser Karlsruhe and the battleship Von der Tann are planning a raid on the vessels of the Allies sailing the lanes near the Atlantic coast. The operator on the British freighter Anglo-Bolivian, which reached Newport News, Va., on December 7, reported that he had picked up messages exchanged between two German ships. The first message was in part as follows:

"Battleship Von der Tann has broken through British and French lines in front of Kiel and racing across Atlantic to meet Karlsruhe."

The second message is said to have been as follows:

"Karlsruhe sighted off Port Antonio heading northward at full speed."

The third message, according to reports, read:

"Steamer President has slipped out of Havana with coal for Karlsruhe."

The wireless operator on the United Fruit liner Zacapata also reported when that craft reached New York on December 5 that when off Jamaica the Karlsruhe had been sighted off Port Antonio, Jamaica, steaming northward at full speed.

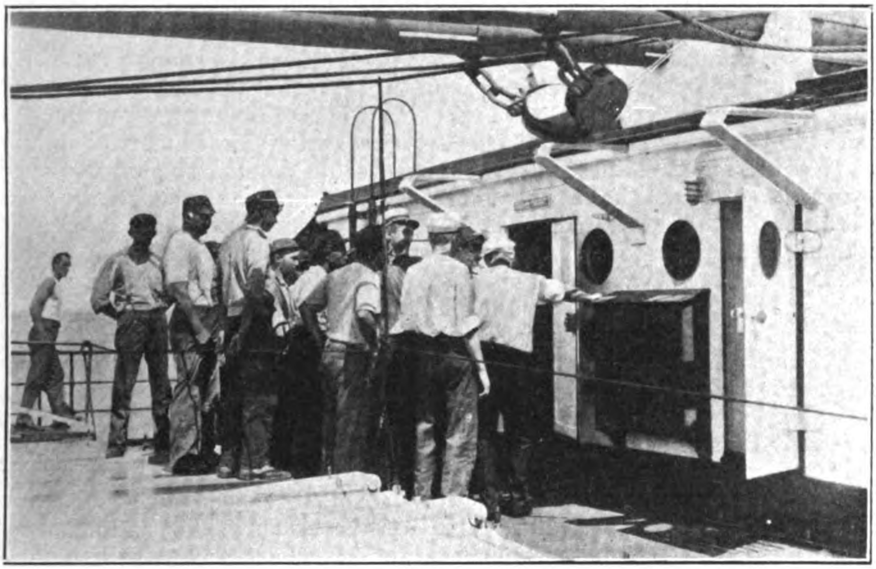
According to a letter from London received in this country, the explanation which has finally leaked out of how the German cruisers Goeben and Breslau escaped from the Straits of Messina after they had been bottled up there by Admiral E. C. T. Troubridge, commanding the British squadron, reveals that a wireless hoax was practiced upon the English officer. At the opening of the war Admiral Troubridge was supposed to have had the German craft practically within his hands. After the ships had made their way out of the Straits the Admiral was recalled home to England and it was expected that his summary dismissal from the service would follow. Instead of being disgraced, however, he was completely vindicated. His country men wondered considerably about this at the time and doubtless are still in a quandary.

It seems that by means of his log book, his flag lieutenant, his secretary and his wireless operator Admiral Troubridge was able to prove without question that he had received a wireless message in the secret code of the British Admiralty, word for word, in official form and signed in the regulation way, ordering him to permit the Goeben and Breslau to escape. On the assumption that his superior officers had better information than he possessed and doubtless had good reason for the order, the Admiral had no doubts as to the genuineness of the message.

But even if he had been uncertain in his mind regarding the matter he did not have time to obtain confirmation from the Admiralty. He received the wireless message on the morning of August 6. The Goeben and Breslau, according to the laws of neutrality, were to have left the Italian port on the evening of that day. Therefore there was no course left for the English officer but to follow

out the order contained in the wireless message, and the German ships steamed out of the Straits without interference, heading for the Dardanelles, where they were "purchased" by Turkey.

The trickery of the Germans was not revealed to the Admiral until he reached England. Then he learned that the Admiralty had not sent him the message liberating the German craft. It had perhaps been flashed by an operator on one of the ships bottled up or from a station under the control of the Germans. The hoax was all the more remarkable because of the fact that only a week before the incident occurred the



Waiting for news outside the wireless cabin on the "El Mundo"

Admiralty changed its wireless code—a practice which it follows periodically. Troubridge received his message in the new code.

In this incident is provided another illustration of the perfect working methods of the German spy system, because it has been pointed out, the British secret code could not have been obtained by any one except through the efforts of a spy whose activities centered among officers of high rank in the British Navy.

A newspaper dispatch from Washington says that the stir caused by the complaint of the British and French ministers in Bogata to the effect that in Colombia there existed secret wireless stations which were keeping the German fleet informed regarding the movements of the Allies' ship has subsided. This is due to the fact that Great Britain and France, through their ministers in Bogota, have notified Colombia that no unneutral acts had been committed by that country. The notification, which came in the form of a cable dispatch to the Colombian legation in Washington, was as follows:

"The British and French legations have recognized the scrupulous neutrality observed by Colombia in the present emergency. Inexact statements in regard to Colombia's neutrality have been cleared away. As regards wireless communication we observe the same practices as in the United States. In regard to coal we permit steamers to take only the necessary quantities to enable them to reach the next foreign port. As Colombia is not bound to the rules of the Hague Convention which allows a larger quantity of coal foreign belligerent ships have not been calling at our ports to ask for coal."

A wireless set has been ordered for the use of the Watertown, N. Y., Naval Reserves. The apparatus will be placed in the state armory in that city.

From and For those who help themselves

Experimenters' Experiences.

FIRST PRIZE TEN DOLLARS

A Dead End "Loose-Coupler"

Numerous articles have appeared from time to time in various publications describing the construction of a "loose-coupler" for the elimination of dead ends. We therefore decided to try our hand at making one and herewith submit a description of the apparatus. We believe that we have produced an ideal tuner, also one that is capable of the reception of long wave-lengths with the effects of dead ends practically eliminated. The completed instrument is shown in Figure 1.

The cabinet for the primary winding is preferably of mahogany or quartered oak with a hard rubber front. The box is 8 inches in length, 4½ inches in heights and 5½ inches in width. The base for the entire tuner is 18 inches by 6 inches. Further details are unnecessary, as they may be obtained from the drawing.

The primary coil is wound with 160 turns of No. 24 S. C. C. wire on a core 4 inches by 6½ inches. This winding is divided into 8 sections as shown in Figure 7. The method of bringing out the taps is also obtained from the drawings. The switch for connecting in the units is of the familiar single blade type. The switch for connecting in the "tens" can best be understood by reference to the drawing. (Figure 2.)

In addition to the single switch blade there are seven metal tabs mounted on the fibre hand as shown. The action of this switch at first may seem complex, but will be readily understood by a brief study of the wiring diagram in Figure 7. The step-up inductance, which is shown to the right of the diagram, has a multiple point switch, throwing it in or out of the circuit. This inductance is used for very long wave-lengths and the size of it will vary with the antenna with which it is to be employed. We used a form for this winding made of a card-

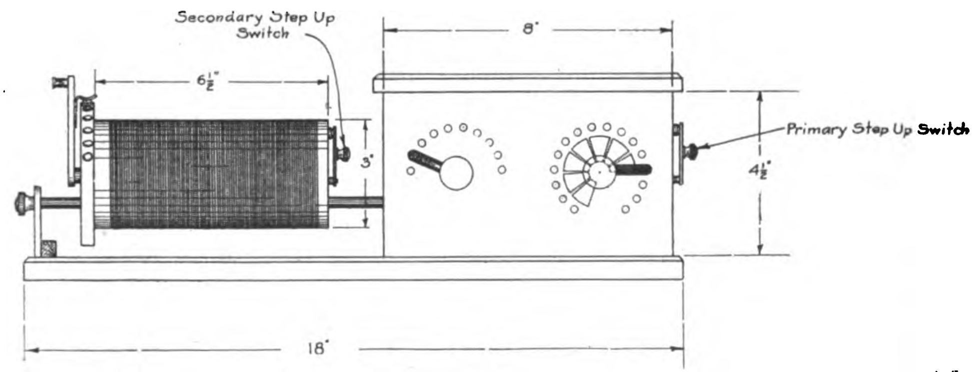
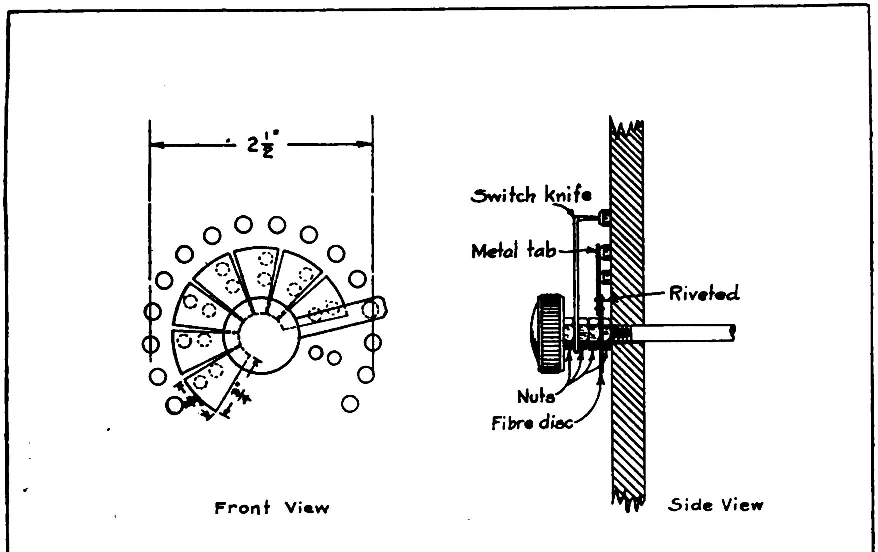


Fig. 1, First Prize Article



TENS SWITCH.

Fig. 2, First Prize Article

board disc just large enough to fit inside the primary core. This disc has a width of ½ inch. It is placed as shown in Figure 3. The switch in Figure 4 for cutting in and out this extra inductance is placed on the end of the cabinet as shown.

The secondary winding has 345 turns of No. 30 D. S. C. wire wound on a core 3 inches by 6½ inches. As shown in the diagram (Figure 8) this winding is much the same as the primary with the exception that it has but three sections. The switch for the secondary winding is somewhat simpler than that shown in connection with the primary winding and requires only two sections for the fan-blade switch. The step-up inductance for the secondary winding (Figure 6), is made of No. 26 enamelled wire on a form ½ inch in width and fixed to the secondary winding in the same manner as that method in connection with the primary winding. After it is placed in position, the wooden end (over the secondary winding) is fastened on and the inductance switch mounted as shown in the finished instrument.

The rods on which the secondary winding slides are ¼ inch in diameter and 18 inches in length. One end sets into slots cut into the inside of the end of the primary winding cabinet, while the other is threaded for ½ inch only and screws into the brass standards. With a cap to fit this should make an

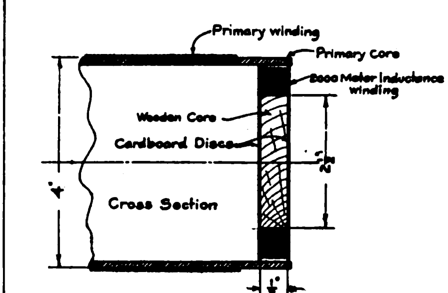


Fig. 3, First Prize Article

excellent binding-post for the secondary winding.

After this set has been properly connected up, the instrument is operated in the following manner:

The step-up switches are thrown into the "off" position and the apparatus is tuned in the usual manner. If you find that the wave-length of a station is beyond the range of inductance afforded, the two extra inductances are thrown into both the primary and secondary circuits, whereupon it will be found that the tuning begins at a wave-length of about 2,200 meters instead of 200 or 300 meters.

ALEX. COCHRAN, HARRY HIGGS, *New York.*

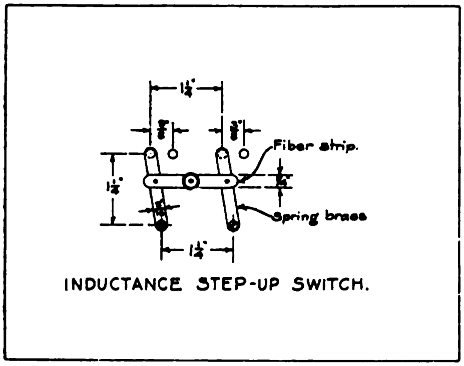


Fig. 4, First Prize Article

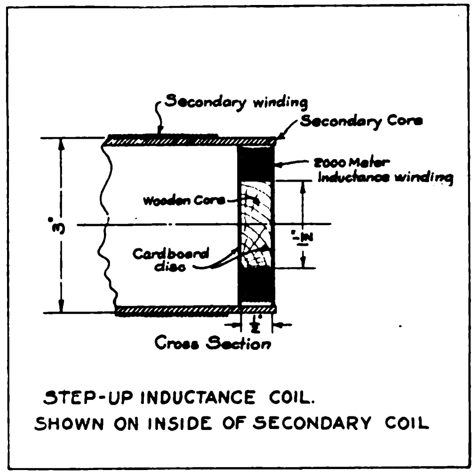


Fig. 6, First Prize Article

SECOND PRIZE, FIVE DOLLARS
An Experimental Arc Gap

Some time ago the writer designed a small arc generator for short range wireless telephone work as shown in Figure 1. The construction is simple, but the apparatus must be built carefully to obtain the highest efficiency. It consists of a steel jacket, 3-16 of an inch thick, faced with top and bottom flanges, in which the arc proper takes

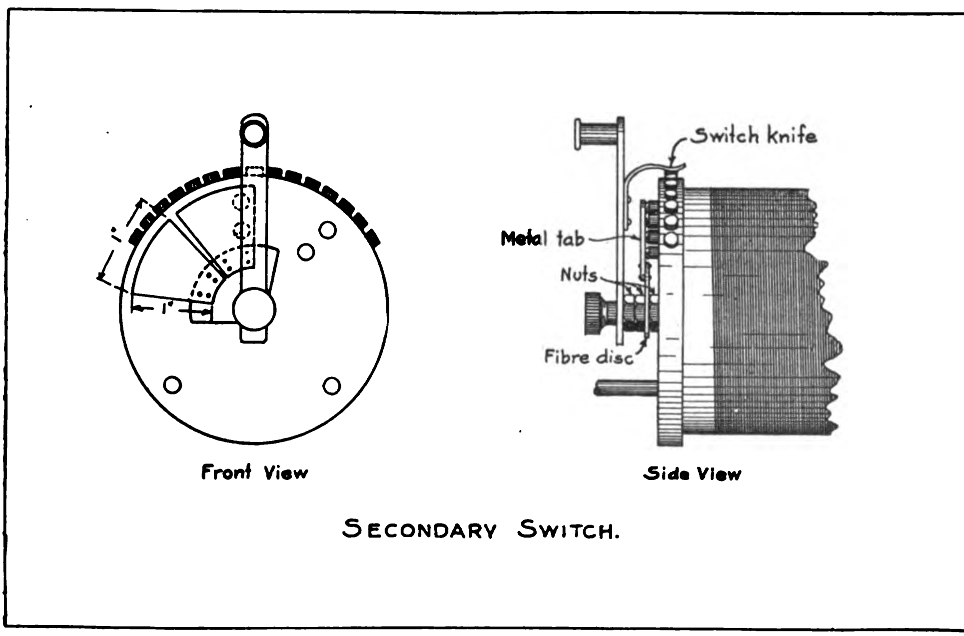


Fig. 5, First Prize Article

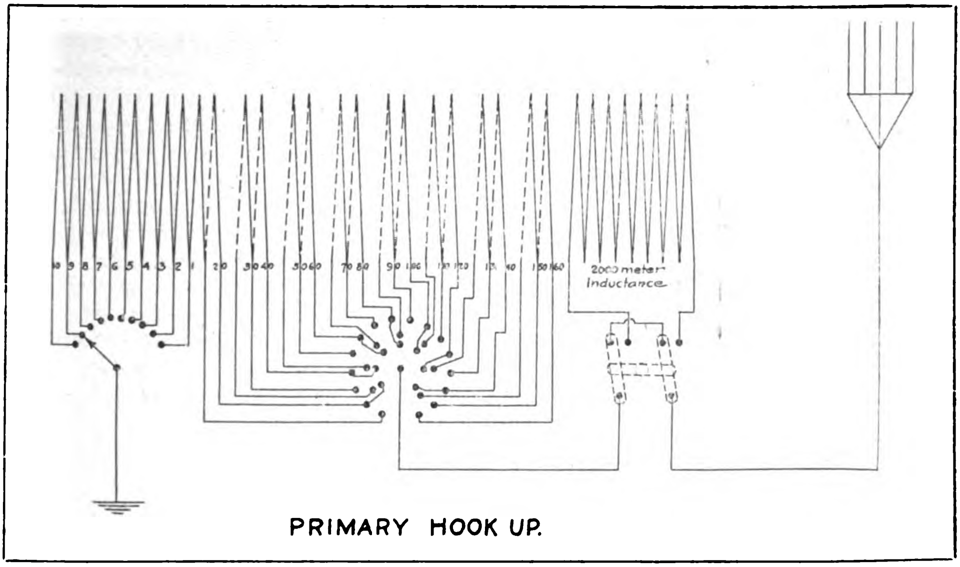


Fig. 7, First Prize Article

place between an upper solid carbon cathode electrode, ½ inch in diameter, and a lower water-cooled copper anode electrode, ¾ of an inch in diameter. The upper electrode is, of course, adjustable, and to provide for quickly starting the arc, the upper or carbon holder is arranged with a special spring under its fibre handle.

A push downward on it causes the anode and cathode to meet, as the uppermost feed adjustment screw and handle merely rests in a depression in the top of the carbon holder. A slate base is provided for the instrument, which rests on four porcelain feet. A ¼-inch brass pipe carries cold water from an *insulated* tank into the hollow copper cathode, and likewise a similar pipe carries away the water. A small motor-driven pump, such as is used on automobile engines, will serve to return the water to the tank, which may be placed outdoors where the air will cool the water. For ordinary work the water cooling is not necessary.

The steel gas jacket provided has a lower gas inlet pipe (⅜ pipe nipple) threaded into it. This is readily attached to an illuminating gas jet or tank with a piece of rubber tubing. A safety valve is fitted to it. Such a valve may be purchased at any engine dealer's shop or it can be made similar to the common "pop" valve used on steam boilers. The one used by the writer cost about $1.25 and is adjustable through a wide range of pressures. The gas jacket is made up of two standard pipe flanges threaded on to a short piece of 2 or 2½-inch iron pipe, their outer faces being turned off to smoothness in a lathe.

A piece of gas engine packing or gasket is placed between the lower flange and the slate base before screwing it down, and also between the

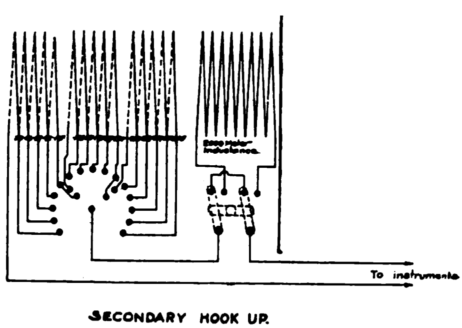


Fig. 8, First Prize Article

upper flange face and the brass ⅜-inch disc, on which the upper carbon electrode mechanism is mounted. The carbon is kept from rotation during adjustment by making the fibre handle flat on both sides. These just slide

nicely up and down between the two legs of the "U" shaped feed bridge. The bridge carrying the threaded feed screw and handle is removable by slotting the feet, hence the carbon holder may be quickly removed and a new carbon inserted. These carbons are of the solid type, ½ inch in diameter,

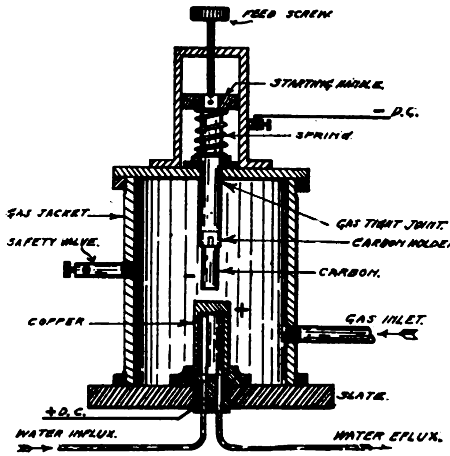


Fig. 1, Second Prize Article

and are known to the trade as "Elektra." The positive D. C. terminal from the arc is seen at the left of the base, while the negative terminal is secured on the side of the "U" bridge piece, as shown in Figure 1.

The arc is rated at ¾ to 1 k.w. and may be used on 110 to 500-volt D. C. lines. The large arcs have been operated on as high as 1,200 volts successfully, and the Collins arc often used D. C. potentials as great as 5,000 volts. At about ¾ k.w. D. C. consumption with the small arc here described, about 1 ampere radiation may be expected. With it communication has been established from twelve to fifteen miles, and if carefully attuned a maximum of twenty-five miles may be obtained, when using 500 volts D. C.

This arc is not fitted with a magnetic blast, for it is unnecessary on the smaller types. Large arcs of this design, rated at several kilowatts, are air-cooled, as regards the anode or copper electrode, by having a stem extending through the gas jacket, which is fitted with a series of cooling vanes of copper.

In the 2 k.w. and larger arcs the carbon electrode is slowly rotated, its speed being about ½ revolution per minute. No direct gas feed is generally arranged for on these arcs, but instead alcohol gas is generated by pouring alcohol, drop by drop, into the arc, where it is rapidly vaporized by the intense heat. An ordinary engine type drip feed oil cup serves for this purpose, and several ways of feeding the alcohol down a pipe into the arc or very near it, are illustrated in Figures 2-A and B. These arc generators, owing to the peculiar characteristics of the undamped oscillations, cover great ranges—telegraphically at least.

The principal trouble met with in wireless telephone work with the arc set is in determining the best manner of varying the energy involved. Considerable success has apparently been attained abroad with the aid of the hydro-transmitter which utilizes a varying stream of water. Multiple type carbon grain transmitters have been the favorite in this country and nothing original has been produced so far. A scheme for handling practically any amount of arc energy as devised by the writer is seen in Figure 2-C. A small metal tube is placed in the arc

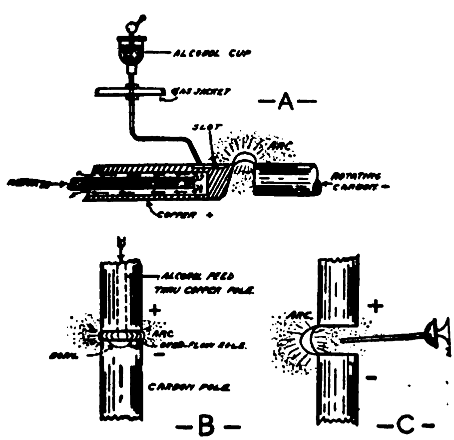


Fig. 2, Second Prize Article

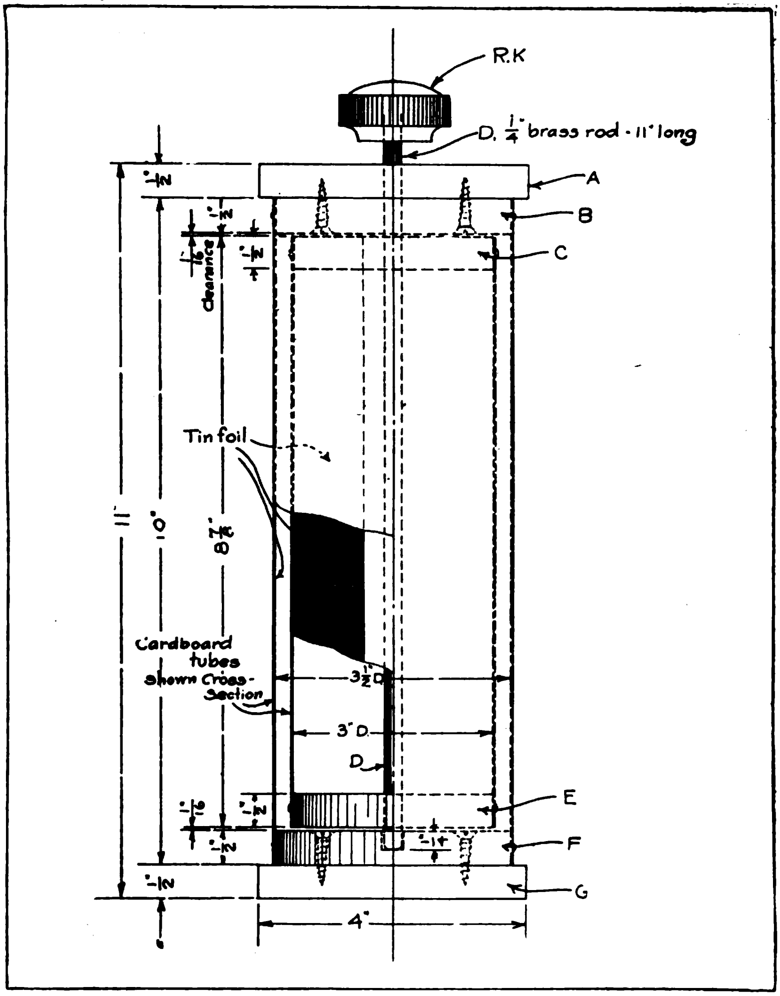
space, and air waves of the voice may be impressed on the arc directly through the tube or by a metal diaphragm placed behind the mouthpiece, T. As is well-known, the arc proper is usually a hollow tube of highly ionized

gas which is very sensitive to shifting air currents, or external magnetic fields. It is surprising how far the arc itself may be *"looped"* out between the two electrodes. Sometimes the actual arc length may be three times the distance between the electrodes. Undoubtedly the problem of handling large arc energies can be readily solved by modern engineering means, making use of a telephone relay, or by proper super-imposition of the talking current on the arc oscillatory circuit.

The condenser capacity to be used with this arc should be approximately 0.005 Mfds. and the inductance value of the primary of the oscillation transformer 0.01 Mhs. If a large aerial is available, the arc gap may be connected directly in series with the antenna.

A choke coil should be inserted between the main line switch and the terminals of the arc to prevent the condenser from discharging back into the generator. These coils may be composed of a core made of thin sheet iron or iron wire about 8 inches in length and 1¼ inches in diameter, or if of rectangular shape, 1 inch square. These coils are then covered with three to four layers of oiled linen and finally four to five layers of No. 12 or 14 D. C. C. wire.

J. W. TOMLINSON, *New York.*



Drawing, Third Prize Article

THIRD PRIZE, THREE DOLLARS

An Inexpensive Variable Condenser

I herewith send the readers of THE WIRELESS AGE a sketch of a variable condenser of my own design which

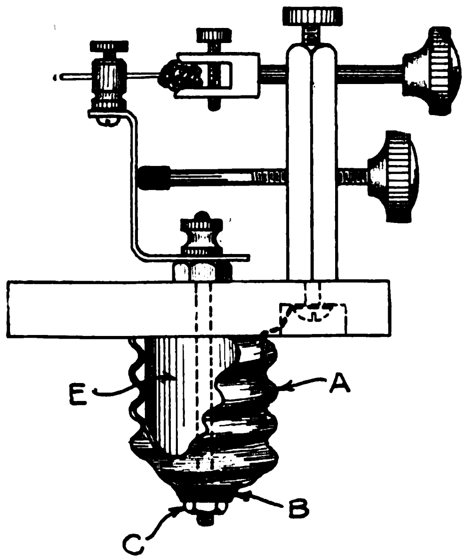


Fig. 1, Fourth Prize Article

should appeal to amateurs on account of the cheapness of construction. By reference to the diamgram it will be observed that there are two concentric cylinders made of cardboard —one 3½ inches in diameter by 10 inches in length, the other 3 inches in diameter by 8½ inches in length. The small cylinder is placed inside the larger cylinder and may be rotated by the handle, R K. The outer cylinder is covered with tinfoil over one-half its circumference, likewise the inner cylinder.

It will be evident that when the tinfoiled outer and inner cylinders are opposite each other we secure a maximum value of capacity; whereas if the inner cylinder is rotated a certain distance, thereby separating the tinfoil surfaces, the capacity of the condenser is correspondingly reduced. Thus we have a variable condenser affording a fair range of capacity and of exceedingly simple construction.

With reference to the drawing: A and G are two pieces of wood 2 inches square; B and F are round pieces 3½ inches in diameter. B is screwed to A, and F to G. Two pieces of wood 3 inches in diameter are fastened to the inner tube as shown at E and C. A brass rod ¼ inch in diameter, 11 inches in length, is passed through the centre of the 3-inch disc, Ç and E. The rod also passes through the block, F, and fits the slot, J. Next slide A and B, which constitutes the cover for the condenser, over the rod, fitting the outer cardboard tube over the inner tube. The hard rubber knob, R K, may be attached to the handle as shown.

GEORGE W. ENGEL, *Pennsylvania.*

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE

A Lamp Socket Detector Stand

The accompanying drawings are not intended to present anything new or original in the way of detectors, and for this reason no dimensions are given. The general idea of design has been adapted from the carborundum stands to be found on the commercial valve tuners of the Marconi Company.

The writer has substituted a regular Edison base for the Ediswan base used

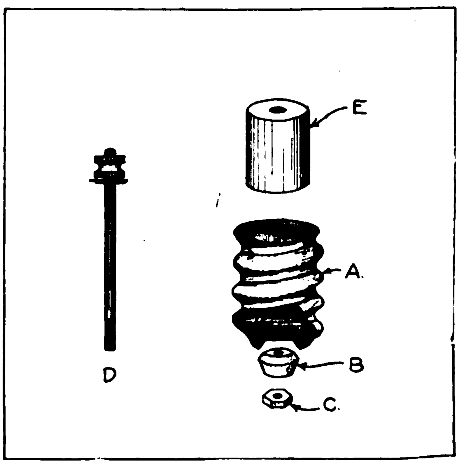


Fig. 2, Fourth Prize Article

on the Marconi detector. Both connections to the detector are made through the base. This, of course, is not practical with the Marconi type, as both contacts are used for supplying current to

(Continued on page 321)

SAILING THE SEAS IN WARTIME

BY E · N · PICKERELL

OF THE S.S. KROONLAND

I HAD been a landsman for nearly a year and had only made one short trip to Liverpool—hardly enough to get my sea legs in working order—when October 15 rolled around and with it my departure on the American liner Kroonland, out of New York and bound for the Azores, Gibraltar and ports in Italy and Greece. The trip (I have just returned at this writing) has been an interesting one, filled with action which was lively and inaction which was livelier still, as you will see. But first let me concern myself with our departure.

It was a miserable, raw and rainy day, one of those sticky Thursdays that sandwich themselves in between perfectly good beginnings and better endings and manage to spoil a whole week. There was no evidence of that natural jubilance somehow associated with the departure of a big ship for distant shores; the passengers gathered along the rail and waved their languid farewells or stood about dejectedly in their dripping raincoats, not one of them venturing the almost inevitable witty sally or even attempting a feeble smile for those on the pier. I was surprised; I hadn't looked for this. A certain amount of weeping, an encouraging message to offset it, a brave, heart-warming smile here and there, a breakdown in hysteria—all these things I looked for in the leave-taking of people who in the main were hurrying to homes in England. But in place of the usual restrained excitement a great apathy had settled over all; it was as if the psychological equivalent of the blanket of fog that stole up the river had come between the slowly moving ship and the shore and shut out all evidences of emotion.

I understood then where seafaring men found justification for a certain amount of superstitious foreboding and unconsciously began to speculate how the war would affect the destinies of that trip. I mention this not as a tangible sensation of inward trepidation, understand, but rather as a hazy impression that the run across and back would hold for me something more exciting than the uneventful pre-

ceding trip, placidly completed during the period when merchantmen were in real danger.

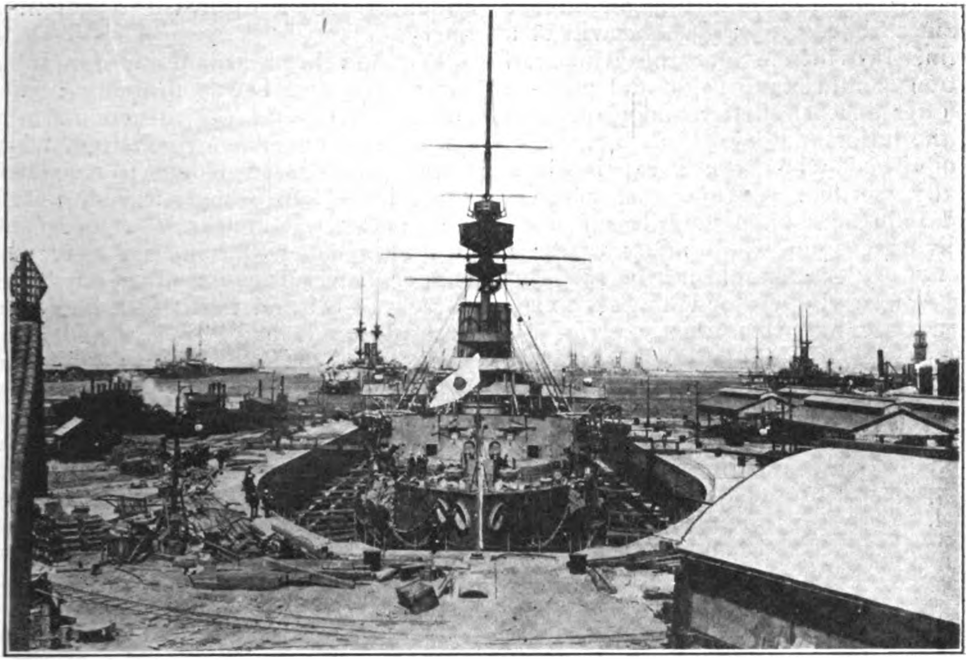
Events took an unexpected turn before our journey had really begun; but the digression from routine was of a kind I had not anticipated. Hardly had the American flag limply flapped from our stern its farewell to the forts that guard the Narrows when out of the buzz of the lower bay I picked up a clear, shrill S O S. It was the United Fruiter Metapan, rammed by the freighter Iowan and sinking just north of Ambrose Channel buoy No. 4.

I was the first to answer the call, replying that we were near him and asking if the Kroonland could be of any assistance. No reply came back. For five minutes the Metapan operator continued his S O S calls and then repeated the details to the Sea Gate station. When Sea Gate had acknowledged receipt, I repeated to both my offer of assistance. Five minutes later a message to Sea Gate requested that the owners be notified that the Metapan was sinking and boats were being lowered over the side. The Monterey then called the Metapan and the Delphic broke in with an offer of assistance. During the next three or four minutes the air was filled with queries; I heard the sparks of the Oscar II, the Sierra, some Dutch steamer and the Iowan, all working clear and sharp in the crowded waters of New York harbor. Then came the news from the Metapan that the sinking vessel had been beached and seventy-six passengers were in the lifeboats. Fifteen minutes later we came in sight of the steamship with her bow well down and several liners and a warship standing by to pick up the lifeboats.

There was nothing that the Kroonland could do, so we sailed right on ahead with but a brief entry in the log to record that the staunch vessel was in readiness to respond to an appeal for aid as she had been just a year and six days before, saving eighty-nine passengers from the burning Volturno.

By the time darkness closed down the incident had passed from the memory of the passengers; with me, however, it was not a case of "out of sight, out of mind," for at some time during the four succeeding nights I regularly heard the wireless gossip about the situation, the messages to the wrecking tugs stating various requirements, and, on the night of the 18th, the Metapan's report that the vessel was listing so badly that the operator had to brace himself against the table and could hardly write. He added that every tide made the stranded ship list more to starboard, so everything had been sent up to New York and all were ready to jump. We were then something like 981 miles away.

With the exception of the interest surrounding the posting of the news bulletins each night everything was quiet aboard until we made our first port of call in the Azores. The sea was like a millpond and the sun shone every day out of a clear blue sky; it was hard to realize the dreadful import of the wireless war bulletins I copied and posted in the saloon. The first one told of the destruction of a new Austrian dreadnaught and damage to six destroyers. That of the following day reported the blowing up of the British cruiser Hawke, sunk by a German submarine, and carrying 350 men to a watery grave. Retaliation was announced in the next dispatches: four German destroyers had been sunk off the coast of Holland; then this news was followed by the official report of General Sir John French that the total British casualties from September 1 to October 8 were 561 officers and 12,980 men. The press of the following day, the 19th, reported the loss of a British cruiser in Chinese waters, blown up by a floating mine, and but one officer and nine men saved. This series of reverses had a depressing effect on the cabin passengers, most of whom were English, but they took their misfortunes gamely and a few remarked to me that the news, even if bad news, was to be preferred to the suspense of uncertainty. "It is the fortune of war," one man remarked. "My countrymen expect these sacrifices and meet them unflinchingly, secure in the knowledge that the tide will turn. Let us hope that the day of a decisive British victory is not far dis-



The whole atmosphere of Gibraltar is very businesslike and ominous. This view of the dry dock shows seven vessels of war within the small radius of the camera

tant. Meanwhile there is some small consolation in dispatches of this character." He pointed to a ten-word unconfirmed report that a French cruiser had sunk an Austrian submarine in the Adriatic.

More than anything else could have done, this man's optimism and unshaken confidence in the eventual outcome of the struggle brought to me a realization of what the war must have meant to those homeward bound voyagers. With me the hostilities were an abstract thing. As an American it was my sworn duty to remain strictly neutral in action and sentiment and I took precious good care that nothing influenced me toward either side. Thus I could not fully realize the import of the messages nor the great horror represented in the few words on details of the slaughter that made up the nightly press bulletins.

I wish to say here, too, that I do not think it well for an operator to listen to the tales from passengers who have some word direct from the stricken territory; or rather, as it is almost impossible to avoid hearing a certain number of these anecdotes, let him at least make a determined effort to put them entirely apart from his work. On board American vessels an air of informality obtains and the wireless cabin is readily accessible to those who care to visit it. I venture to say that every single first cabin passenger aboard the Kroonland paid me a visit at some time or other during the voyage. Naturally I could have heard a great many stories intended no doubt to enlist my sympathies with the side the speaker represented. Many nationalities might have been placed in favorable lights by their respective supporters had I listened to all my garrulous visitors had to say, and in the long run I should probably have committed myself to some opinion that would have violated the personal neutrality program I had mapped out for myself. Therein lies a grave consideration. The wireless operator has a tremendous responsibility in his hands these days and it is my firm conviction that he who does not rigidly school himself in the conviction that this great international tragedy does not

concern him is committing an offense against his country; it is the will of a divine Providence that the American nation should stand aside and prepare to offer succor, shelter and protection to the unfortunates of both victor and vanquished when the great issue is finally settled. Various associations and influences have doubtless formed individual opinions in many cases; I do not say that should not be so. But the American operator who goes to sea at a time like this must restrict his favoritism to a mental reservation which never for an instant enters into the accomplishment of the day's work.

But to return to my trip.

At 8 o'clock on the evening of October 22 we dropped anchor at S. Miguel, Azores, our first port of call. Everything was tranquil and quiet here and as far removed in spirit from the activities of wartime as the stretch of trackless ocean we had just traversed. During the night I learned that some Germans among our passengers had left the ship here and gone ashore to avoid possible complications at Gibraltar. This proved a wise move, although we anticipated nothing at the time.

Gibraltar was sighted on the following Monday morning. Here everything was very business like and ominous. As we came through the strait a British submarine, No. 26, crossed our bows. Less than ten minutes later a grim looking torpedo boat dashed astern of us and I saw the officer on watch making a minute inspection of our nameplate through his glasses. About 200 vessels lay at anchor in the bay and sombre-hued warships of all classes darted in and out among them as we steamed slowly to our anchorage. This was at 10 o'clock in the morning.

At 10:10 A. M. I was a wireless operator in name only. A British officer came aboard before the liner had come to a full stop. He sought me out immediately. "I will be obliged to you, sir," he said without any preliminaries, "if your aerial is lowered to the deck at once. It will remain there until your vessel leaves the port." That was all; but it was enough. Down came the aerial in a hurry.

We had been at anchor for some little time and I was figuring how I could best spend the afternoon in a port I had never before visited, when word was passed along to me that shore leave had become a very uncertain matter. It appears that our main cargo consisted of some 1,400 tons of copper, several cases of rubber and barrels of oil and that these had been declared contraband of war and open to seizure. Pending the cargo's ultimate disposal we would lay at anchor just where we were.

For a solid week we did not move and no one was permitted to go ashore. From time to time we heard that negotiations were in progress between Washington and London and Gibraltar as to whether or not our cargo was rightfully open to seizure.

The first day of our detention passed off agreeably; the passengers took their predicament good naturedly and our captain, J. B. Hill, made every effort to please the whims of each particular passenger. On the second day the word went around that we might be detained for a week, and perhaps longer, but that the passengers were in no physical danger and the vessel was well provisioned. Aside from mild protests from a few impatient ones, the cabin passengers on the whole took this intelligence with surprising fortitude and forthwith prepared to make themselves comfortable for the stay.

When the word was passed down to the steerage an exactly opposite effect was produced. There were about 700 Italians and 400 Greeks below decks and all night long the steerage buzzed with protests and maledictions. They were disgruntled because they were delayed in the voyage to their native lands and on the morning of the third day after the arrival of the Kroonland at Gibraltar the ill-humor of the Italians induced them to send a delegation to the captain to voice their protest. It was headed by an Italian who in his own circle was no doubt considered somewhat of a dandy. His dark features and hair gave him an appearance that was not altogether un-

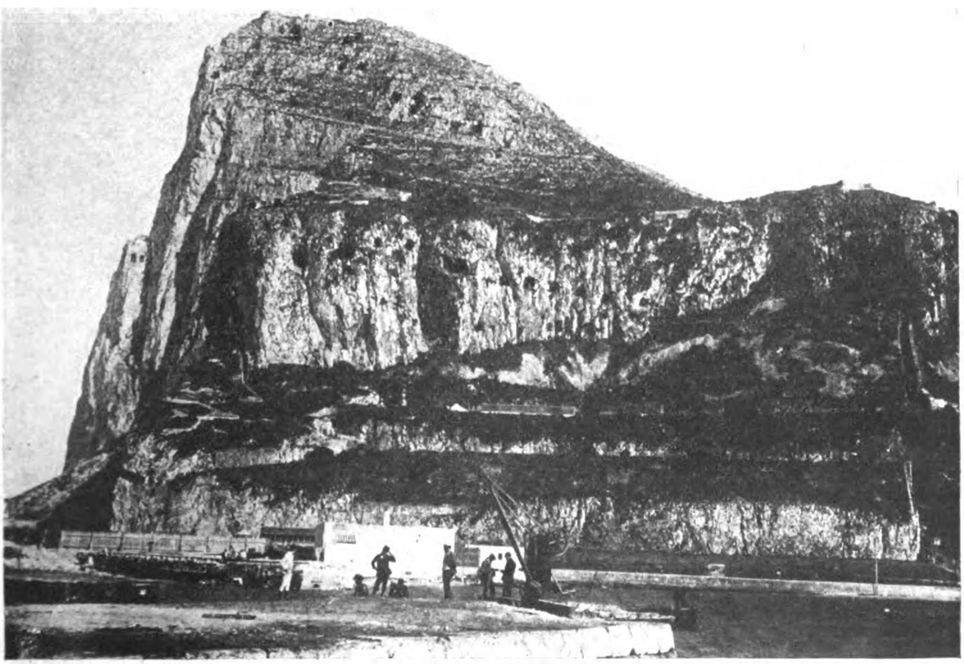
picturesque, but his attire was extremely incongruous.

As the members of the delegation made their way to the first cabin deck the officers of the ship attempted to stop them, but were unable to do so. Their complaint was apparently without avail, for the captain was visited several times by the same delegation. At length he sent ashore for the Italian consul, who assured the dissatisfied passengers that they were held prisoners only temporarily. They seemed to be pacified at first by this statement, but after a time they were imbued with the idea that he and the captain were one and the same. At any rate, their grumblings began anew.

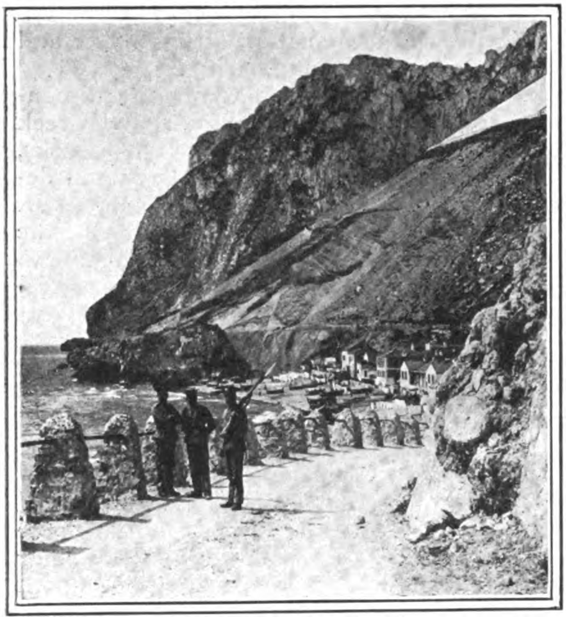
Not to be outdone in the matter of protesting, a Greek delegation also visited the captain. Their attitude was so threatening that an officer of the ship ran up a flag to summon a police boat. The latter came alongside the Kroonland, causing considerable excitement among those on the steamship. The captain, however, was displeased at the action of his officer and reprimanded him sharply.

In the hope of allaying the discontent the captain summoned the Greek consul, an Englishman. The Greeks, expecting evidently that he would deliver an address, obtained places of vantage in the rigging and on the hatches. But the consul was unable to speak their language and it was necessary to obtain an interpreter. Great was the disappointment of the steerage folk when they found that he was a stranger to their speech.

The chief steward was acquainted with the Greek and Italian temperments, and he sought to lessen the tension of the situation by serving liberal portions of wine. But it did not have the effect of promoting good humor among the ruffled ones. In fact, about two days before the Kroonland left Gibraltar they threatened the captain with various kinds of unpleasantness, ranging from death by hanging to a



The Rock of Gibraltar itself is composed of gray marble in the form of what the British term "an enormous lion"; it is three miles long and rises to a height of 1,400 feet. The black squares show some of the openings to the fortified galleries



England maintains a watchful garrison and in my visits ashore I was frequently stopped by soldiers and the numbered ticket which served as a pass was carefully examined

place in the digestive organs of a shark.

My interest in the disgruntled Italians and Greeks was overshadowed not long afterward by the news that the first cabin passengers and the officers of the ship would be permitted to go ashore. This announcement came after the Kroonland had been taken alongside the Mole, an island connected to the mainland by long piers.

I was only too glad to get ashore and visit the picturesque fortress. On reaching the mainland I found myself in a narrow street which was filled with Arabs selling dates and other fruits. It was a cosmopolitan throng that I rubbed elbows with as I trudged along. Once I bumped into a Spaniard who was just about to climb into his seat on the vehicle which conveyed sightseers to and from points of interest. Again I found myself walking along with a short, ruddy faced Englishman. And a short distance ahead of me could be seen the figure of an American, walking along with an alert, springy step. Many of the pedestrians were British soldiers and as I strolled farther into the heart of the town I saw more of them.

The town, I found, is divided into two parts by the Alameda Park. It is not laid out with any great regularity, but it contains several handsome buildings. Well up on the summit of the rock is a wireless station which is maintained by the British government. The aerials of the station can be seen from passing ships. It is maintained solely for official business and is not employed otherwise except in cases of distress.

When I returned to the ship I found the passengers gossiping of the British naval manœuvres which were to take place that evening. The objective point of the fleet was the expanse of water enclosed by the Mole and the two piers connecting it with the mainland. When ships enter this stretch it is necessary to open one of the two gates which are at each end of the Mole.

During the manœuvres fifteen searchlights swept the waters in the neighborhood of Gibraltar, their rays reaching as far as the Spanish and African coasts. The spectators on the decks of the Kroonland would be gazing into ink-like darkness when suddenly the searchlight would throw its glare upon an object which was revealed as a war ship. This spectacular exhibition, which took place every evening during the time we were at Gibraltar, constituted one of the most interesting features of the voyage.

Our departure from Gibraltar was marked by manifestations of returning good humor on the part of the Italian steerage passengers who were anxious to reach their homes. As we neared the shores of their native land and came into sight of the smoke of Mount Vesuvius, which could be seen for seventy-five miles, they began to sing operatic airs. When we arrived in the Bay of Naples and they were permitted to land their joy reached the hysterical stage. They could not get ashore quick enough and some of them narrowly escaped injury in their mad scramble to leave the ship.

While we were at Naples I picked up a wireless message from the battleship Tennessee to the battleship North Car-

olina. The latter had been reported as sunk, the message said, and Secretary Daniels was investigating the report. The North Carolina answered that she would communicate with Washington by cable.

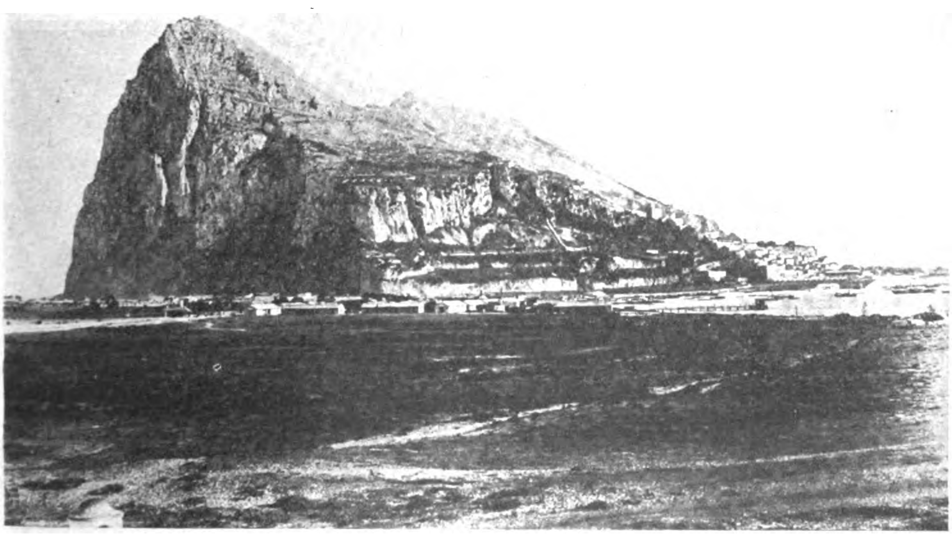
After remaining two days at Naples we departed for Piraeus, passing through the Straits of Messina, which are about five miles wide. Through a glass I saw the ruins of Messina, which vividly recalled to my mind the story of its devastation by tidal wave and earthquake. I was again reminded that I was in the war zone as we were steaming through the straits, for while passing some small islands at night two searchlights were turned on us. They were presumably directed by Greeks.

The Greek passengers on the Kroonland heralded our arrival at Piraeus by singing. They began to raise their voices as soon as the acropolis came into sight and continued to sing for a long time. The attention of the Americans among us was aroused when they saw in the harbor the battleships Mississippi and Idaho, which the United States sold to Greece. They recalled the histories of the craft and speculated at length concerning their activities since they had passed out of the possession of the United States.

We touched again at Naples after steaming away from Piraeus. There we took aboard a considerable number of American passengers hurrying to their homes as a result of the war. At Genoa, too, we took aboard Americans who were fleeing from the war-ridden countries.

An incident which caused no little excitement occurred on our arrival at Gibraltar for the second time. A German was discovered among the men of our crew through becoming involved in a fight with another of our ship's company. The German was made a prisoner and sent ashore. This was the only occurrence of note which took place during our eighteen-hour stay at Gibraltar.

It was without regret on my part that I saw the Kroonland's nose pointed toward the United States and freedom and peace. I have entered a goodly number of ports in my ten years of wireless service, but when on December 6 we steamed past the Statue of Liberty it seemed like an entirely new experience. I guess that was because I was just a little bit relieved at coming through in perfect safety, a trip which was not quite eventful, but certainly interesting to a marked degree.



Another view of Gibraltar, showing the neutral ground between the British stronghold and the territory of Spain

How to Conduct a Radio Club

By E. E. Bucher

ARTICLE IX.

IN the article of this series published in the November issue we described the method of measurement of the total logarithmic decrement of two coupled circuits. The reading obtained included the decrement of the aerial circuit and the decrement of the wave-meter itself. We may then rewrite the equation as follows:

$$\Delta_1 + \Delta_2 = \frac{C_1 - C_2}{C_r} \times 1.57 \quad (\#1)$$

Where

Δ_1 = decrement of the aerial circuit.

Δ_2 = decrement of the wave-meter.

Obviously if we wish to obtain the value of Δ_1 we must determine the value of Δ_2 and subtract it from the total value as per equation #1.

The decrement of the wave-meter is obtained in the manner shown in Figure 1. The coil, *L*, of the wave-meter is placed in inductive relation to the antenna and the measurement made as described in the previous issue.

A piece of resistance wire, R, is stretched between two binding posts and connected in series with the wave-meter circuit. The amount of wire employed is determined by the sliding contact, T'. A piece of #28 German silver wire about 15 inches in length will be found satisfactory.

With the pointer of the wave-meter set at C_2 or resonance, the spark gap is energized and sufficient resistance added at *R* until the readings of the watt-meter falls to exactly one-half that obtained in the original reading, viz., 0.04 watts. The condenser of the wave-meter is then shifted to either side of resonance to

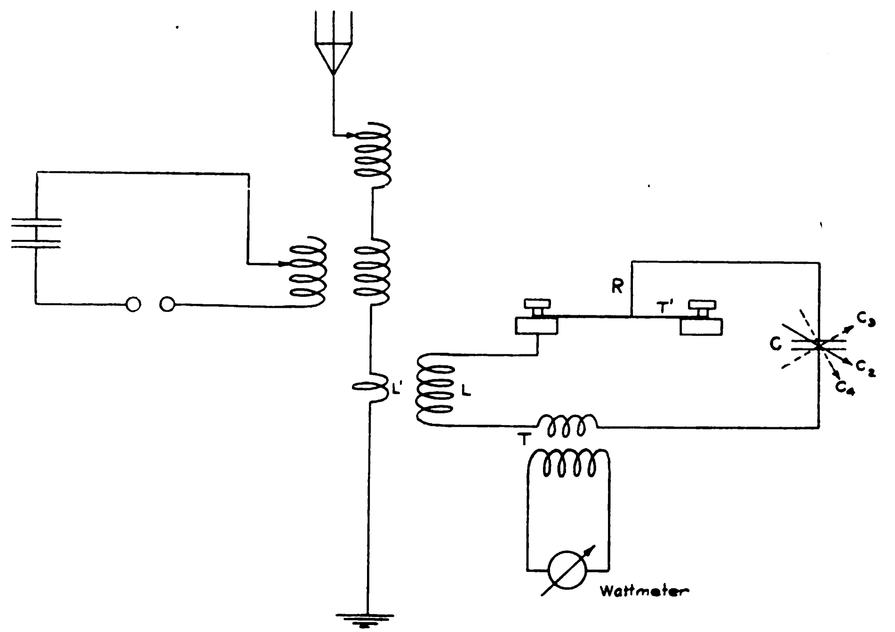


Fig. 1

such a value of capacity that will give one-half the reading at *Cr*, viz., 0.02 watts. Let these two values of capacity be represented by C_3 and C_4.

We may then write

$$\Delta_1 + \Delta_2 + \Delta_3 = \frac{C_3 - C_4}{Cr} \times 1.57 \quad (\#2)$$

Now Δ_3 is the decrement due to the addition of the added wire, R, and it is evident that if the value $\Delta_1 + \Delta_2$ is subtracted from $\Delta_1 + \Delta_2 + \Delta_3$ the value of Δ_3 is at once obtained.

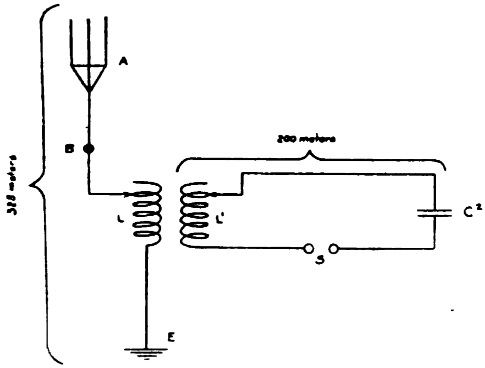


Fig. 2

It has been shown by Fleming and others that the value of d_2 the decrement of the wave-meter may be obtained from the following formula:

Letting V stand for the value obtained in equation #1, and V^1 for the value in #2 then

$$\Delta_2 = \frac{V^1 \Delta_3}{2V - V^1} \quad (\#3)$$

Hence by subtracting the value of Δ_2 from $\Delta_1 + \Delta_2$ we have Δ_1 the decrement of the transmitting circuit under test. Suppose for example

$$\Delta_1 + \Delta_2 = .15 \text{ and}$$
$$\Delta_1 + \Delta_2 + \Delta_3 = .17 \text{ then}$$
$$\Delta_3 = .02 \text{ and}$$
$$\Delta_2 = \frac{.17 \times .02}{.30 - .17} = .026 \text{ and}$$
$$\Delta_1 = .15 - .026 = 0.124$$

Hence the emitted wave from this aerial fully complies with the United States regulations.

Throughout the entire series of measurements described in this and the previous issue, extreme care must be taken not to change the coupling between the wave-meter and the circuit under measurement. Also the power input to the transformer must be kept as constant as possible and the spark discharge remain uniform.

If two frequencies or wave-lengths are present in the antenna circuit the decrement measurement may be applied to each separately.

If means are at hand for obtaining the following values the decrement of the wave-meter may be calculated by the formula:

$$\Delta_2 = 1.57 R^1 \sqrt{\frac{C}{L}}$$

where R^1 = High frequency resistance
C = Capacity
L = Inductance

It may be of interest to amateurs here to define the difference between a "pure" and a "sharp" wave, according to the United States regulations.

A transmitting set is said to emit a pure wave when even if there are two frequencies present in the antenna circuit the energy in the lesser one is not more than ten per cent. of that in the greater. Thus if the watt-meter, as used in Figure 1, should indicate 0.09 watts at the peak of the longer wave-length and slightly less than 0.01 watts at the second wave-length, the regulations are wholly complied with.

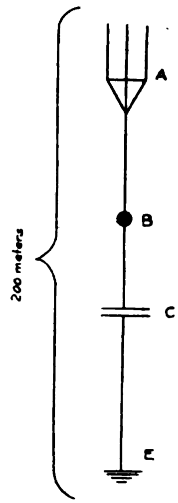


Fig. 3

A "sharp" wave is one where the logarithmic decrement is less than 0.2 per complete oscillation. This value is obtained by the method just described.

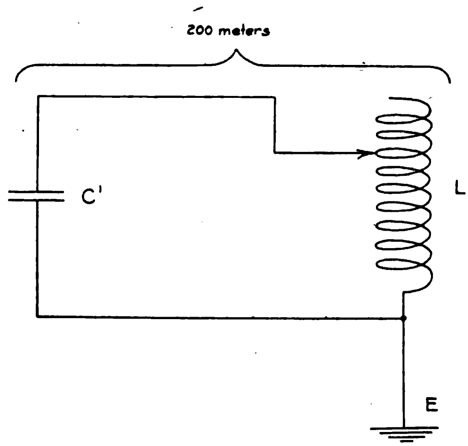


Fig. 4

The writer wishes to impress the fact upon the members of amateur organizations that the measurement of the decrement as described is wholly within their grasp and with the proper apparatus may be obtained by a few simple operations.

The Short Wave-Length

It may be of interest to the amateur field to know that it is possible to radiate a short wave-length on a long aerial without the use of a series condenser. Suppose for example that an amateur possessed an antenna the natural wave-length of which is 325 meters, and that during the period of transmission it is desired to radiate a wave-length of but 200 meters. Ordinarily this is accomplished by the insertion of a condenser in series with the antenna circuit, but the same effect may be produced by placing a condenser in shunt to the secondary winding of the oscillation transformer.

Referring to Figure 2, *A,B,E* is an antenna which has a natural wave-length of, say, 325 meters when the secondary winding, *L*, of the oscillation transformer is connected in series. In order to obtain the proper values of the shunt condenser, the antenna connection is broken at *B and* an adjustable high potential condenser is inserted in series to

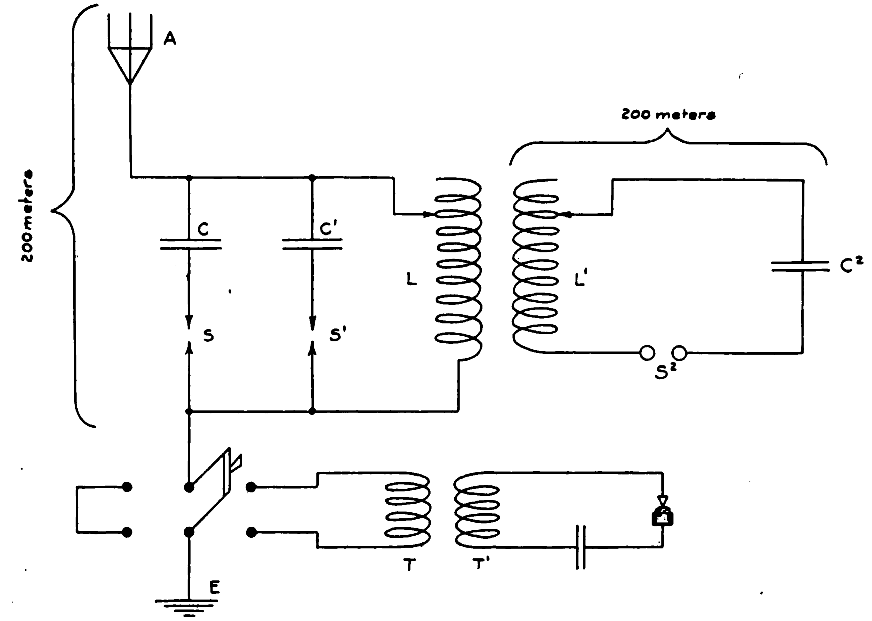


Fig. 5

the earth, as per Figure 3. The circuit, *A,C,E,* is excited by a spark gap connected to a source of high potential and readings taken on a wave-meter. The values of *C* are altered until the antenna circuit gives a wave-length of 200 meters.

A condenser of similar capacity to *C*, which may be known as C^1, is connected in shunt to the secondary winding of the oscillation transformer, *L*, and the contact adjusted so that the condenser and

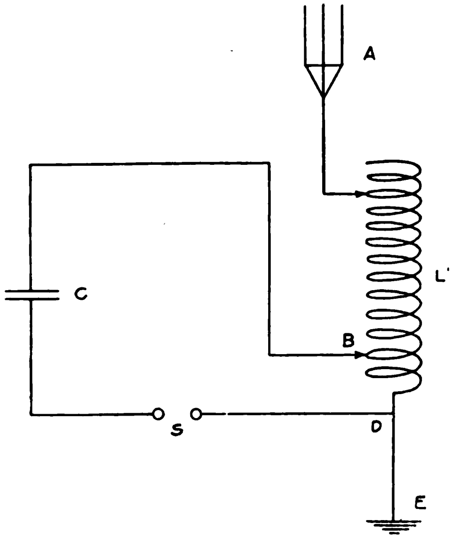


Fig. 6

the secondary winding have a wave-length of exactly 200 meters, as per Figure 4, or as an alternative the entire winding, L^1, may be used and the values of C^1 adjusted until the circuit has a period of 200 meters.

The values of *C* and C^1 having been determined in this manner, the combination is connected up as per Figure 5; that is to say, both condenser units *C* and C^1, are connected in parallel and in shunt to the secondary winding of the oscillation transformer, *L*. The closed oscillatory circuit of the transmitter, consisting of the inductance, *L*, condenser, C^2, and the spark gap, S^2, is adjusted to a period of 200 meters.

If a wave-meter is placed near to the earth circuit it will be found that the emitted wave from the combination is exactly 200 meters. The condensers, *C* and C^1, are preferably of the glass plate type immersed in oil. If it is desired to insert the antenna switch for the receiving apparatus in the earth lead of this equipment as per Figure 5, then the condensers, *C* and C^1, are discharged through needle gaps, *S* and S^1, respectively. The received oscillations therefore will pass from the antenna, *A*, through inductance, L^1, to the primary winding of the receiving tuner, *T*, and into the earth.

If the discharge gaps, *S* and S^1, were not inserted energy of 200-meter wave-lengths would be absorbed in the condenser circuits themselves. The method as described was first adopted and used by the Marconi Company.

Notes on Coupling

Many amateurs are under the impression that in order to have their sending stations emit a pure wave it is necessary to employ an oscillation transformer of the inductively coupled type. The oscillation transformer of the "plain helix type is therefore apt to be discarded as valueless. A little consideration of Figures 6 and 7 will show that this is positively untrue, for it is quite as possible to radiate a wave of a single frequency and low decrement with the direct coupled oscillation transformer as with the inductively coupled type.

In Figure 6, *A*, L^1, *E*, is the antenna circuit at any station, L^1 being a helix of the type usually found in amateur stations. The condenser, *C*, of the closed oscillatory circuit, *C, B, D, S,* is of such value that in order to place this circuit in resonance with the antenna circuit, no more than one-half turn is required between contact, *B*, and the end of the helix, *D*.

It is at once evident that the mutual inductance between the closed and open circuits is of small value; hence the reactions are unimportant and the emitted wave is practically of a single frequency, having a decrement value wholly within the United States regulations. It may be argued that the mutual inductance under such conditions is insufficient for the proper transfer of energy, but it may be added that this has been wholly disproven by experiment.

Let us consider another case as per Figure 7. Here the closed oscillatory circuit has a great number of turns of

inductance and the value of C is correspondingly small as compared with the previous case. If the closed oscillatory circuit, L^1, D, S, C, B, has a period of, say, 200 meters then the antenna circuit,

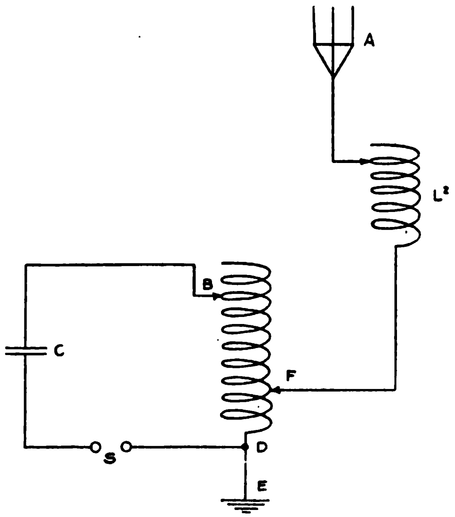


Fig. 1

L^2, F, D, E, may likewise be adjusted to the same wave-length. If no more than one or one and a half turns are inserted between the contact, F, and the helix, D, it is again evident that the value of mutual inductance between the closed and open oscillatory circuits is small, hence the emitted wave is pure and sharply defined.

It is recommended that both diagrams have careful consideration on the part of amateurs, for they will thus be able to proportion the circuits of the transmitter to comply with the law using the equipment ordinarily at hand. Of course a wave-meter is required for these adjustments and for examination of the purity of the wave.

(To be continued.)

THE SHARE MARKET

New York, December 17.

With the reopening of the exchanges, after being closed for more than three months on account of the war, light trading was resumed in American and Canadian Marconis. Up to this time the English issues have not appeared in the outside market in consequence of which the brokers could not give out quotations today. The prices of American shares remain almost identical with the selling figure which obtained when the trading closed down in July.

Bid and asked prices today:

American, 2¼—2⅝; Canadian, 1⅜—1¾.

MARCONI INJUNCTIONS STAND

In the suit of the Marconi Company against the De Forest Radio Company and the Standard Oil Company for infringement of certain patents, in which Judge Hough recently granted the Marconi Company a preliminary injunction, the court has made another decision.

It appears that subsequent to the former decision the defendants moved to suspend the injunction pending an appeal, in so far as it related to the boats of the Standard Oil Company, and also another motion to vacate or modify the injunction with respect to both the defendants.

These motions were brought up on additional affidavits, but Judge Hough, in a decision filed December 15, denied all of the motions, thus refusing to suspend the injunction as to the Standard Oil Company and to vacate or modify the injunction as to both defendants.

AMATEUR FINED

Frederick A. Parsons, of 754 Beck street, the Bronx, New York City, an amateur wireless operator, pleaded guilty before Judge Foster in the United States District Court, on November 11, of operating a radio station without the necessary government license, using a wave-length in excess of 200 meters, which interfered with commercial stations and using unofficial wireless call letters. He was fined and cautioned not to repeat the offense.

This is the second case of this kind reported to the District Attorney by W. D. Terrell, Radio Inspector in Charge, the former case being that of Elman B. Myers, of 239 West 103d street, New York City, who was also fined $50 for operating a wireless telephone without a license.

Marconi Men

The Gossip of the Divisions

Eastern Division

J. Woltal has replaced L. H. Marshall as senior operator on the Alamo. Marshall has resigned from the service.

John Lohman has been assigned to the El Norte, which is a one-man ship.

H. J. Ingalls and F. Lumea have been assigned to the Concho as first and second operators, respectively.

M. B. Berger has been transferred from the Mexico to the Guantanamo.

Matt Bergin, formerly of the steam yacht Aloha, has been assigned to the Camineo, of the Pacific Coast Division. The Camineo is engaged in the San Francisco-New York trade.

Walter Tylar has been assigned to the Llama, a newly-equipped vessel, which is running to England.

S. Merrill and E. Burr have been assigned to the Comanche as senior and junior, respectively.

Peter Podell is now on the Santiago.

James A. Rowe has returned to the El Oriente after a short leave of absence.

Arthur Lynch has been assigned to the Hawick Hall, a new boat.

M. Mendelsohn and R. Pettit have been assigned to the S. V. Luckenbach, which has been re-equipped. The Luckenbach is one of the many boats of this and the Pacific Coast Division that will pass through the Panama Canal on its trips from coast to coast.

J. A. Worrall and R. R. Squires have been assigned to the Medina as first and second operators, respectively.

W. C. Graf and C. Meyer are now on the Guiana.

J. J. O'Brien and C. W. Sturz have been assigned to the Sabine.

R. G. Merry has been re-engaged and is now on the Rio Grande.

J. A. Bossen is now on the Coamo.

J. G. Porter has replaced H. B. Cowan on the Maracaibo. George Abbott is second man.

F. A. Schramm has resigned from the service.

Earle Wellington has rejoined the Energie.

Doc Von Eichwald, of the Tennyson, has been made a prisoner of war by the British authorities at Barbados. It seems that when the Tennyson on her voyage up from Buenos Aires stopped at Barbados, the British government officials, in making their now customary inspection of the passengers and crew of all British vessels which stop at that port, discovered the Doc, and as he could not show that he was anything but a citizen of Germany, he was promptly removed from the ship and is now interned in Barbados, where he will probably be held until the end of the year. The Doc, however, writes that he is receiving excellent treatment and "is in no danger of being shot at sunrise," for which he is duly thankful.

J. R. Byers, who made a trip to England on the Marquette (an English vessel), has resigned from the service.

N. W. Filson is now on the Camden.

From the following incident related to us, it would seem that Marconi men can be heroes in more ways than one. While the Maracaibo, of the Red D Line, was lying in a lagoon off a port in Venezuela, Junior Operator George Abbott decided to go overboard for a short swim around the vessel. He jumped in and started to swim away from the vessel, but poor George had overestimated his powers as a swimmer, for he soon found himself going under. His plight was noticed by those on board the ship, however, and Senior Operator Cowan immediately dived to his junior's assistance. By this time Abbott had gone down three times and had about given up all hope of ever seeing New York again. Cowan reached his side, grabbed hold of his head and swam to a floating log nearby. Abbott and Cowan were rescued by a boat from the ship.

Cowan maintains that the affair isn't worth mentioning, but Abbott believes differently and thinks Cowan is deserving of a Carnegie Hero medal. Cowan, by the way, is now attached to the Vigilancia.

E. J. Quinby, who was at the key when the pilot boat New Jersey was rammed and sunk off the Jersey coast some time ago, is now on the El Rio.

H. B. Marden, who has been off on sick leave, is back on the Antilles.

William Gruebel and H. E. Seigman have been assigned to the Iroquois as senior and junior operators, respectively.

Clarence S. Rice has been reassigned to the Camaguey.

H. G. Hopper, of the Baltimore Division, has been assigned to the Northwestern.

George Soupos is now senior operator of the El Cid.

C. Sandbach has been assigned to the Maryland, an English vessel, replacing Operator Holdsworth, of the London office, who died recently from appendicitis at Baltimore. The English company was represented at the burial services held by Superintendent Stevens and men of the Baltimore Division.

D. Brand is now on the El Valle.

F. J. Murphy has been assigned to the Stephano, replacing S. Hopkins, who goes to the Nueces as first operator.

George Gerson, who left here last summer on the Buenaventura, was recently removed from that vessel suffering from an infected eye and will be confined to the Port Townsend Marine Hospital for a short period. Up to the time of his illness Gerson had been doing wonderful work with his set, receiving San Francisco when still 3,000 miles south and transmitting even greater distances. Operator Percy L. Wostear, of the San Francisco office, relieved him on the Buenaventura.

M. W. Grinnell and A. E. Ericson are first and second operators, respectively, on the City of Macon.

Southern Division

Operator O. S. Ferson has joined the staff of the Miami station, relieving F. A. Nelson, who was transferred to the Somerset.

Operator K. W. Orcutt has been transferred from the Florida to the Juniata, filling the vacancy caused by the resignation of operator Marsano.

Henry McKiernan of the Virginia has relieved operator F. Crone as assistant operator of the Essex, William Vogel having been transferred from the City of Baltimore to the Essex as senior operator.

G. H. Fischer has been transferred from the Cretan to the Dorchester as senior operator.

J. E. Bell has been assigned to the Howard as junior operator in place of J. L. Brannon. Mr. Bell is now with his brother, L. E. Bell, who is senior of the Howard.

C. Sandbach has been assigned to the British steamship Maryland on account of the death of operator Holdsworth.

C. R. Robinson has been placed on the Juniata as senior operator, filling the vacancy caused by the transfer of operator H. H. O'Day.

Operator L. H. Gilpin has been transferred from the Somerset to the Gloucester, relieving R. A. Gardner, who has been transferred to the British steamship Raphael. The Raphael will make several trips from Newport News to Bordeaux, carrying horses for the allied troops.

H. Graf has been assigned to the Kershaw as senior operator, filling the vacancy caused by the transfer of Sewell Smith to the new steamer Francis Hanify, which has just been equipped at Wilmington, Del.

Operators Rosenfeld and Goldblatt were on the trial trip of the Great Northern, which took place recently. The Great Northern has just been equipped at the plant of William Cramp & Sons.

Operators E. Overall and R. F. Taylor have been assigned to the British steamship Rembrandt, which was recently fitted at Baltimore. This vessel will make a number of trips to France, carrying horses for the troops.

Operator William Holdsworth, of the British steamship Maryland, was recently operated on for appendicitis at the Maryland General Hospital. He died several days after the operation. A number of the operators and staff of the Baltimore office attended the funeral.

Manager H. C. Hax of our Cape May station has been relieved by Ernst Her-

rera, who until recently was manager at the Havana station. Mr. Hax has decided to go to sea again and will be assigned to the steamship Great Northern, which will leave for the Pacific Coast some time in January.

Constructor J. F. Wyble has returned to Baltimore from Savannah and Jacksonville. He has been down south making some changes in the aerial at Savannah and overhauling one of the steel towers.

Constructor M. C. Morris has been kept very busy lately installing apparatus on the Great Northern, Henry M. Flagler and the torpedo boat Downes.

Constructor E. M. Murray had a rush job in installing the apparatus on the steamship Francis Hanify. A 2 kw. 500-cycle quenched gap panel set was installed on this vessel.

T. M. Stevens, who was recently appointed acting superintendent of the Southern Division, was greatly surprised when on the morning of November 25th he received from Boston a handsome gold watch. The watch is a 19 jewel, Riverside, Waltham, and has the following words engraved: "Presented to T. M. Stevens by his friends at the Marconi Wireless Station, Boston, Mass., Nov., 1914." Mr. Stevens desires to express his thanks for the watch and the letter which accompanied it.

Owing to several cases of smallpox at Cape Hatteras, all the operators have been vaccinated. For some reason or other it did not "take" with Manager Albee and operators Harrigan and Daily. However, the scare is about over.

Pacific Coast Division

We are informed, on very good authority, that one of our old operators, Elwin Day, became a benedict November 4th. Congratulations, Elwin.

Operator A. E. Gerhard, now at the trans-Pacific station at Marconi, has successfully passed the extra first grade examination with high honors, receiving a percentage of ninety-four and seven-tenths.

Operators E. T. Jorgensen and G. S. Bennett, of the Sierra, made quite a record for the voyage ending November 27th, having printed eight issues of The Ocean Wireless News, with sales of 300 outbound to 49 passengers. The return voyage increased the sales by 118 copies, all that were on hand.

An operator, on a certain coastwise steamer, was recently advised to obtain a key for the wireless room from the mate. Through some misunderstanding, the key was not obtained, and the captain was advised by the steamship company to close the room immediately. Not knowing the reason for this mysterious order, the captain promptly obtained a large padlock, and tearing a few links off the anchor chain, securely fastened the room. The cigar is on us, captain!

Operator H. Oxsen, of the Aztec, was granted a vacation over the holidays, leaving on December 8th.

W. R. Lindsay recently joined the Aroline as assistant on November 24th. Lindsay has been in poor health lately, and the change of run will, undoubtedly, do him good.

C. M. Jackson has sailed on Barge 91, having left Point Richmond, December 5th.

C. B. Berry has been assigned to the Centralia, which left San Francisco November 7th.

A. C. Forbes and C. Bentley have been assigned as first and second of the China.

F. M. Roy and R. G. Landis are acting as first and assistant on the City of Para.

M. W. Michael relieved F. Wiese on short notice recently. Wiese was obliged to leave the vessel on account of illness.

J. H. Baxter has been transferred from the Enterprise to the Hilonian. Baxter was temporarily assigned to the Enterprise as purser and operator.

W. P. Schneider has been temporarily assigned to the F. A. Kilburn as assistant.

P. M. Proudfoot recently joined the F. H. Buck on a short notice call.

C. F. Fitzpatrick, who was temporarily assigned to the Governor as assistant, will be given a vacation for one trip at Seattle, in order that he may spend some time with his relatives.

H. C. Moore was recently assigned to Honolulan as assistant.

M. Smith, formerly assistant on the Klamath, was granted a vacation December 7th.

R. A. Germon, in charge of the Siberia for the last eleven months, was recently made operator in charge of the Korea.

W. E. Gawthorne and N. A. Woodcock were recently assigned as first and second of the Lurline.

L. V. R. Carmine was recently transferred to the Matsonia as operator in charge.

A. R. Short was placed recently in charge on the Northland, with P. E. White as assistant.

G. H. Harvey and C. A. Peregrine recently left San Francisco for Panama as first and second respectively of the Peru.

T. J. Welch recently left for South America as operator in charge of the Portland.

F. Mousley relieved G. Jensen as first of the President, December 5th. Jensen is taking a vacation for the holidays.

H. Hatton is back on the Queen as chief, after a short vacation in Seattle.

T. Lambert was recently assigned as assistant on the Rose City. Lambert assures us he will raise the limit on sales of The Ocean Wireless News.

W. P. Giambruno was recently placed on the Roanoke as assistant.

I. L. Church was recently transferred to the Santa Rita.

F. J. Callahan, as first, and J. M. Flottman, as second, left San Francisco recently on the Siberia. We understand Flottman expects to raise the "bag limit" this trip on newspapers.

H. Bodin was assigned as first of the Santa Clara on December 2nd.

W. J. Erich relieved G. Crous as first on the Ventura this trip, November 22nd.

Seattle Staff Changes

R. E. Cowden is back on the Humboldt, after having made a trip South on the Queen so as to visit his home in San Francisco. H. Hatton, of the Queen, had charge of the Humboldt during Cowden's absence.

P. C. Millard, ex the Tatoosh, is on the Latouche.

There have been more lay-ups this fall than in former years, and as a result a number of vessels are now manned by two first grade men.

J. C. McCarty and J. E. Johnson are on the Jefferson.

C. F. Trevatt and August Lang, a good British-American and a good German-American, are on the City of Seattle. We hope the wireless set comes back, anyway.

A. Boots is temporarily on the Chicago.

F. Wilhelm and W. R. Blanchard are on the Alamera.

H. F. Wiehr, ex the Dolphin (laid up), is now on the tug Wallula at Astoria.

M. Musgrave and G. W. Woodbury are now on the Dora, out of Seward for Unalaska.

C. F. Fitzpatrick is "laying off" the Governor at Seattle for one trip. He was relieved by R. Ticknor.

NEW LICENSES WITHOUT RE EXAMINATION

The new edition of "Regulations Governing Radio Operators and the Use of Radio Apparatus on Ships and on Land," issued by the Department of Commerce contains two provisions to be noted by all wireless men. They follow:

"Persons holding radio operators' licenses of any grade should, before their licenses expire, apply to the nearest radio inspector or examining officer for renewal and submit Form 756 in duplicate."

"Radio operators of the commercial or cargo grades whose licenses show on the service records satisfactory service for three months out of the last six months of the license term may be issued new licenses without re-examination. Other operators who submit satisfactory evidence to the examining officer showing actual operations of radio apparatus for three months during the last six months of the license term may be issued new licenses without re-examination. All others will be re-examined in the usual manner."

Queries Answered

Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of an individual can be answered. To receive attention these rules must be rigidly observed.

Positively no Questions Answered by Mail

E. B. W., Wilkes-Barre, Pa.:

Ans.—(1) After noting your sketches we advise that aerial A is undoubtedly the one for use with the 1 k.w. Clapp-Eastham auto-transformer. The aerial wires should be connected together at the free end.

Your third query brings up an important question. The frequency of the closed oscillatory circuit of a transmitting set and that of the supply circuits are two totally different factors. For example: The frequency of the primary circuit of a sending set may vary from 60 to 500 cycles, while the frequency of the closed oscillatory circuit varies in ship work from 500,000 to 1,000,000 cycles per second. A rotary spark gap fitted to any set increases the spark frequency and not the oscillation frequency. You should distinctly understand the difference between spark or group frequency and the frequency due to the discharge of a condenser through a coil of inductance. Take for instance, the 500-cycle synchronous rotary spark set giving 1,000 sparks per second. Each spark takes place in 1/1,000 of a second, and during the life of one spark a number of high-frequency electrical oscillations are released from the condenser through the spark gap circuit (anywhere from 15 to 25 in number). Each of these oscillations takes place in a millionth of a second or 1/500,000 of a second, depending upon the constants of the circuit.

When we say, therefore, that the frequency of the closed oscillatory circuit of a radio set is a half million cycles per second, we do not mean that in one second of time one half million cycles actually took place, but while the circuit is in vibration the oscillations take place *at the rate* of 500,000 per second; the actual number of oscillations produced per second depends upon the damping of the circuit.

The station at Sayville, L. I., is in occasional communication with Europe. The Marconi station at Glace Bay maintains a 24-hour service with Clifden, Ireland.

* * *

R. E. R., Kansas City, Kas., writes:

Ques.—(1) Please give dimensions for a glass plate condenser to be used with a ½ k.w. 13,200-volt transformer and 500-cycle rotary gap.

Ans.—(1) If it is a 500-cycle rotary synchronous discharger type of apparatus, your condensers may consist of 3 plates of glass 14 inches by 14 inches, covered with foil 12 inches by 12 inches. The glass should have a thickness of about ⅛ of an inch.

Ques.—(2) What is the capacity of such a condenser?

Ans.—(2) The capacity of this condenser is approximately 0.006 Mfds. It might be advisable to use a series parallel connection. You would therefore require 6 plates of the size given, in parallel in each bank and the two banks connected in series.

* * *

W. Q. R., Baltimore, Md., writes:

Ques.—(1) I have an aerial 60 feet in length and 40 feet in height, composed of four No. 14 copper wires spaced 2 feet apart; lead-in. 20 feet taken from highest end; ground connection to water pipe, and the following instruments: Murdock "loose-coupler," loading inductance, fixed condenser, crystal detector, two Blitzen variable condensers and 3,000-ohm telephones connected up as per diagram in the article entitled "Instructions to Boy Scouts" in the June, 1914, issue of The Wireless Age. I have not been able to receive a greater distance than 50 miles, day or night. NAA time signals are very loud and I have also tuned NAA on 4,000 meters when transmitting with NAR at 2 P. M.

Will you kindly suggest what I should do to increase my receiving range? Is my aerial too small or is the trouble with my instruments?

Ans.—(1) You should secure good results with this apparatus and the diagram of connections in the article referred to. Perhaps the conditions about your station are not ideal for long distance work. If you intend to receive from the higher power stations the size of the aerial should be increased. Are you sure you have a good earth connection? Are there any loose joints in the antenna circuit? Is your antenna shielded by water tanks, high steel buildings, etc.? Think these matters over carefully and you may be able to solve the problem.

Ques.—(2) Is there any advantage in connecting two variable condensers across the secondary of a "loose-coupler"?

Ans.—(2) No. It depends upon the capacity of the condensers. If one variable condenser has insufficient capacity for a given wave-length it will be necessary to add another.

Ques.—(3) What is the wave-length of my aerial?

Ans.—(3) 175 meters.

L. H. A., Trenton, N. J., writes:

Ques.—(1) After NAA sends time at 10 o'clock in the evening he sends the weather report. I have noticed that he sends DB instead of A for Atlantic City. Please tell me what this DB means and what place it stands for?

Ans.—(1) The letters DB refer to Delaware Breakwater, off Cape May, N. J., which were substituted for A—Atlantic City, N. J.

Ques.—(2) In this department recently I saw that one of your subscribers asked about the station DK. I get this station also and notice that he uses a cipher code. There seems to be another station answering him who signs HA. This station never calls DK, but calls DY and signs HA. Can you give me any information as to these two stations? HA also uses a cipher code.

Ans.—(2) The strange signals you hear are undoubtedly foreign battleships operating in these waters.

Ans.—(3) The Marconi station at Glace Bay, N. S., is apt to be sending at any moment during the twenty-four hours. The power is approximately 180 k.w. and the wave-length normally 8,000 meters. Other wave-lengths may be used at certain periods.

Ans.—(4) A receiving tuner capable of receiving signals from Key West is not necessarily the proper equipment for receiving from Glace Bay on account of the difference in wave-lengths. It is rather difficult to receive long wave-lengths on short aerials. It is not at all probable that a receiving tuner capable of adjustment to wave-lengths of the Key West station will have sufficient values of inductance to tune to a wave-length of 8,000 meters.

Ans.—(5) We are told that the station of the National Electric Signalling Company at Brooklyn, N. Y., includes two transmitters, both of 500 cycles frequency, using the Fessenden rotary synchronous gap giving a group frequency of 1,000 per second. The smaller set is of 2 k.w. primary power and operates normally upon a wave-length of 600 meters. The larger set is of 10 k.w. input and is used on wave-lengths between 1,800 and 2,400 meters, usually at about 2,200 meters. As a rule the latter set is operated at 6 k.w. power.

* * *

C. M. A., Minneapolis, Minn.:

You have a badly balanced receiving outfit. Of what use is a 5,000-meter loading coil in connection with a "loose-coupler" having a range of only 600 meters? Furthermore, you say that you have two variable condensers of four Mfds. capacity each. Have you any idea of the range of wave-lengths this capacity will afford? What stations do you intend to receive from? If you intend to receive from 600-meter stations only, do away with the loading coil and use the 600-meter tuner. The aerial as described has a wave-length of about 290 meters.

There is no distinct advantage in building a rotary tuner except the ease with which the coupling can be adjusted. A loading coil does not necessarily cut down the strength of signals. If it is necessary for securing resonance, then it will give an increased strength of signals. A considerable amount of information has appeared from month to month on this subject in The Wireless Age and we advise you to study the subject of receiving tuners very thoroughly.

* * *

H. C., Benzonia, Mich., writes:

Ques.—(1) I have a silicon detector in which an "E" violin string, "catwhisker," rests across the edge of the silicon. It is completely knocked out of adjustment when I send, even if short-circuited. Are there any means of protecting it? I use a 3/8-inch coil for sending and do not understand why I should have so much trouble with this detector. The operator at the Ann Arbor station at Frankfort, Mich., used this form of detector with a 2 k.w. sending set and secured satisfactory results and a local amateur uses it with a 1/2 k.w. set.

Ans.—(1) There are three methods of protecting a receiving detector during the period of sending: (1) Completely disconnect the detector from all receiving tuning circuits while sending; (2) disconnect the detector and place a shunt switch around it; (3) shunt the detector with a condenser of about 5 Mfds. capacity during the period of sending. The third method is preferable. You understand that when a receiving detector is placed close to a transmitting set the sensitive condition is destroyed by the electrostatic field of the transmitter. These effects may sometimes be eliminated by placing the detector in a metal box, which is in turn connected to the earth. Detectors are frequently thrown out of adjustment by vibration from the transmitting key when sending and perhaps this is your trouble.

Ques.—(2) Is a "catwhisker" detector stand suitable for use with molybdenite?

Ans.—(2) Yes.

Ques.—(3) Is the "Radioson" detector any more sensitive than the standard bare point electrolytic detector?

Ans.—(3) We do not write from experience, but we have heard that it is not quite as sensitive. The sensitiveness of the bare point electrolytic detector depends upon the size of the platinum wire employed.

Ques.—(4) Does current from a 3/8-inch spark coil have high enough voltage to leak through dry wood?

Ans.—(4) Yes.

Ques.—(5) Would 50 crow-foot batteries give enough current to maintain an arc for a short distance wireless telephone?

Ans.—(5) The current output of a crow-foot cell is exceedingly small. We fear that you will not be able to secure satisfactory results.

* * *

W. W. T., Martinsburg, W. Va.:

You have gone beyond the limit in the number of queries, but we shall endeavor to solve some of your problems. The windings of the Blitzen receiving transformer will allow adjustments to wave-lengths up to 1,500 meters. Several amateurs advise us that if a variable condenser is placed in shunt to the secondary

winding and another to the primary winding, the tuner has sufficient range for the reception of signals from the Arlington station.

The natural wave-length of your antenna is about 325 meters.

We have noted your diagram and advise you to change the construction from the "T" type to an inverted "L." This will give increased range of wave-length. The tin roof under the antenna increases its capacity and consequently the wave-length. The wires of the antenna should be soldered together at both ends.

You are doing fairly good work if you receive Key West and Cape Cod. If you had a receiving tuner with a larger number of turns the signals from Sayville would be increased. The Audion detector, properly understood and adjusted, gives better signals than the crystal detectors. We have no specific advice to give for increasing the range of the station except that if you desire to receive the longer wave-lengths you should use a large receiving tuner. Note past issues of the Queries. If you will examine the Queries Answered department in past issues of THE WIRELESS AGE you will find full information regarding the design of receiving tuners for long wave-lengths.

* * *

M. V. B., Nyack, N. Y., writes:

Ques.—(1) I have a ½ k.w. Clapp-Eastham closed core transformer; synchronous rotary spark gap having 18 points; an oil condenser having 2 sections of plate glass, each plate 8 inches by 10 inches with tin-foil 6 inches by 6 inches and 20 plates in each section; an oscillation transformer, 14 inches by 12 inches, having 16 turns of ribbon on primary, and secondary 2 inches larger over the primary; key; and 0-3,000 mili-amp. meter. This set is connected to a 110 V. A. C. 60-cycle commercial circuit. How many amperes should this set register on the meter if working properly? I can get only 1 ampere at the present time.

Ans.—(1) Why do you employ so many turns in the primary winding of the oscillation transformer and so few in the secondary? Furthermore, what is the wave-length of your aerial? It would seem that your circuits are out of resonance; even if they were in resonance you need not expect more than 2½ or 2¾ amperes in the antenna circuit.

Ques.—(2) What difference does having the two sections of a condenser connected in series or parallel make when the condenser as a whole unit is hooked up in parallel? In my set I find that with the condenser hooked in parallel with the units in series the spark is not so noisy, but it moves the ammeter. With the condenser in parallel and the two units in parallel also, the spark is loud and does not move the meter a hair's-breadth. Why is this?

Ans.—(2) When you have two sections of 20 plates each in series, the resultant capacity is the same as 10 plates in parallel—in other words, about 0.005 Mfds. With all the plates connected in parallel you have a resultant capacity of 0.02 Mfds. With the latter connection the wave-length of your closed oscillatory circuit is decidedly too long, hence better results are secured when the plates are connected in parallel series. How many turns do you employ in the primary winding of the oscillation transformer? Have you tried varying the turns progressively, from one turn to maximum? Have you tried an aerial tuning inductance in the antenna circuit to see if an increased energy flows? Do you know the wave-length of your aerial circuit? Have you a wave-meter at hand? If so, adjust the spark gap circuit and the antenna circuits to resonance. The solution of your troubles seems to hinge upon the wave-length of the antenna.

The sketch accompanying your query leads us to believe that you are not familiar with series parallel connections of condensers.

* * *

E. P. D., Baltimore, Md.:

We are not familiar with insulating compounds made from the ingredients you suggest. We have no information at hand and suggest you get into communication with one of the large concerns manufacturing various insulating mixtures.

The Marconi Wireless Telegraph Company of America controls the cerusite detector exclusively and concerns attempting to sell these crystals will be held liable.

We do not understand your fifth query. What radio stations and apparatus do you refer to? What use do you intend to make of such photographs?

* * *

F. D. U., Elgin, Ill., writes:

Ques.—(1) For some evenings I have heard an unknown station on about 8,000 meters' wave-length. Its note is entirely different from that of a quenched, rotary or slow spark transmitter, resembling the hissing sound produced by escaping steam.

Owing to the extreme faintness of these signals it was impossible to copy any complete messages. What fragments I did get were in English, each word being sent twice, very slowly; the destination of the messages was apparently Germany. No station signature was obtained on any night. One afternoon recently I heard this same station testing. It finally signed WGG and I identified it at once as the Tuckerton station.

I am wondering if you can tell me whether WGG is now using the Goldschmidt high-frequency generator. If so, what explanation can be offered for the fact that we hear the signals with the ordinary type receiver using a crystal detector and an audion amplifier?

Ans.—(1) The station you hear is undoubtedly that at Tuckerton, N. J. The Goldschmidt high-frequency alternator has been damaged and a Poulsen arc type of transmitter has been temporarily installed. You hear the signals from this station because you are using an audion, which under proper adjustments is an ideal receiver of undamped oscillations.

* * *

R. G. L., Philadelphia, Pa.:

The wave-length of your antenna is about 155 meters. With the Murdock apparatus

you describe you should be able to receive a distance of about sixty or seventy miles in daylight and 300 to 400 miles after dark. You require a loading coil for receiving the signals from Arlington. It should have a value of inductance at least equal to the primary winding of your present receiving tuner.

* * *

G. L. L., St. Anthony, Iowa:

You cannot purchase audion bulbs independently of the complete equipment. Communicate with the De Forest Radio Telephone & Telegraph Company, 309 Broadway, New York City.

* * *

J. M. C., Little Rock, Ark.:

Ques.—(1) Give the dimensions, amount and size of wire, etc., for an all-round "loose-coupler" for amateur use.

Ans.—(1) It is almost impossible to give you dimensions for an all-around receiving tuner for amateur purposes because we do not know over what range of wave-lengths you desire to work. Furthermore, we must know the size and wave-length of the aerial to be used. Do you wish to receive from amateurs only or do you expect to establish communication with the higher power stations? Examine past issues of THE WIRELESS AGE, particularly the Queries Answered department, where any amount of data is given for the construction of "loose-couplers" and various types of receiving transformers.

Ques.—(2) Are amateur operators supposed to discontinue the operation of their stations during the European war?

Ans.—(2) No; not as long as they act within the limits of the law.

Ques.—(3) After an amateur's station and operator's license expire, what should be done to obtain renewals?

Ans.—(3) Communicate with the radio inspector in your district.

Ques.—(4) Can any amateur who has a wireless station which is in good working order, join the American Radio Relay League which was described in THE WIRELESS AGE for November?

Ans.—(4) Yes.

Ques.—(5) What is the resistance of an ordinary lead pencil and can one be used as a potentiometer?

Ans.—(5) The resistance of the lead in the ordinary pencil varies widely. The lead in the ordinary pencil has a value of resistance too great for use as a potentiometer.

* * *

I. W. D., Peekskill, N. Y.:

The natural wave-length of your aerial is about 250 meters and when you add the secondary winding of the oscillation transformer in series, the emitted wave-length will be about 325 meters. Will the government authorities allow you to use this wave-length in the neighborhood of your home? You have not given us the diameter of the windings of your oscillation transformer and we therefore have had to guess regarding the primary winding, which, we believe, has insufficient turns for resonance. You will secure better results from your transformer if you use five sections of the Murdock condenser. If your circuits are in proper resonance, your sending range will be from 50 to 60 miles and your receiving range from 100 to 1,000 miles.

A list of stations with their call letters, as requested, is as follows:

NKL, U. S. S. Monoghan; NNG, not registered; WST, Miami, Fla.; WEA, S. S. City of Cleveland III; WCY, Cape May, N. J.; WKO, S. S. Oregonian; WSK, Sagaponack, L. I.; KYZ, not registered; DK, British cruiser; DL, British cruiser; DM, British cruiser; DY, British cruiser; JH, not registered; HA, British cruiser.

From and for Those Who Help Themselves

(*Continued from page* 300)

the filament of the valve as well as for one side of the detector. The other connection is made with a flexible cord to a post on the tuner.

Referring to the diagrams: Figure 1 shows the assembly of the various parts. Figure 2 shows a disassembled view, the parts being lettered identically in each case.

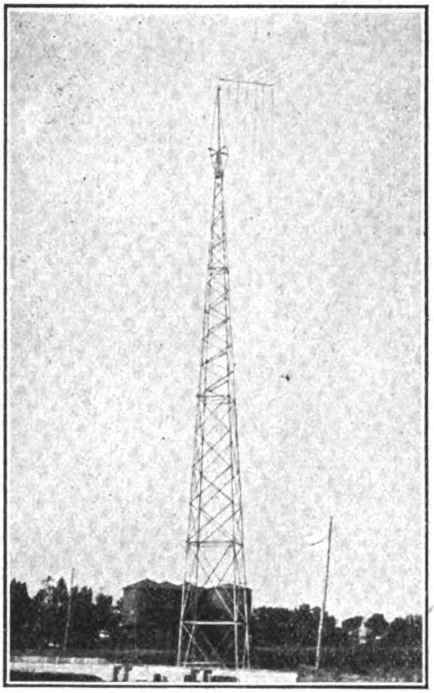
A is the brass shell only of an Edison base. B is a rubber washer cut to shape (Figure 2) and replaces the black wax used in the original assembly of the base. E is a hard rubber or wooden cylinder over which the shell is slipped. All parts are now firmly clamped together and then inserted in the round detector base by the threaded rod, D, (Figures 1 and 2). This can be accomplished with a reasonable amount of care and patience, the writer having made up several detector holders as described.

The advantage of the screw base type lies in the fact that any number of detectors, all mounted on the lamp base described, may be used at different times as desired without the usual mess of wires and unsightly screw holes left by previous types. Simply screw in the detector wanted, and all connections are made ready for use.

A flush or a raised receptacle may be used on the box or table, but personally I prefer the raised type, finished in lacquered brass.

If desired, a keyed socket may be employed; the key affords a convenient method of cutting out the detector while sending, or when the set is not in use.

R. V. KEEVER, *Michigan.*



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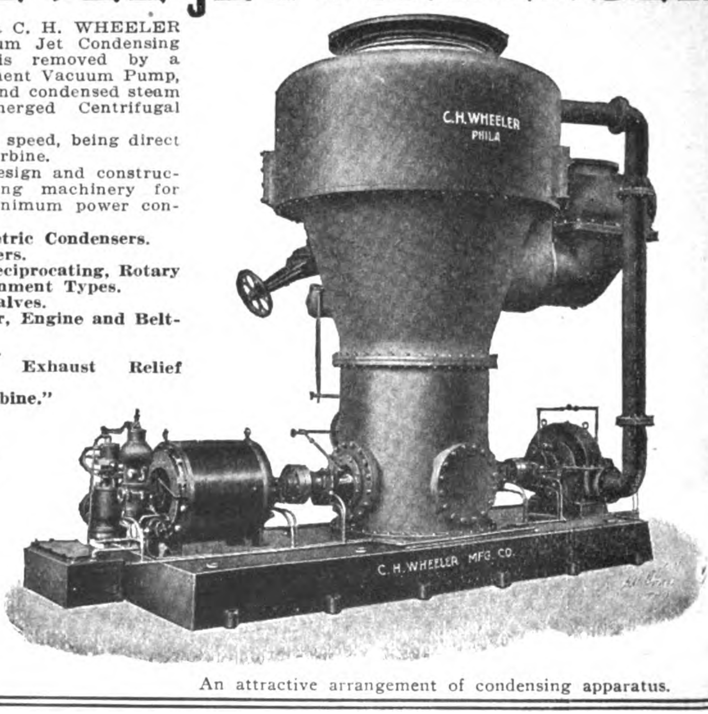

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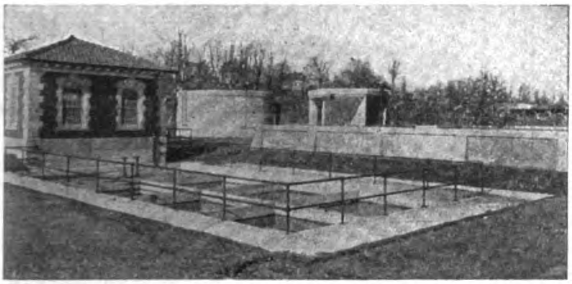

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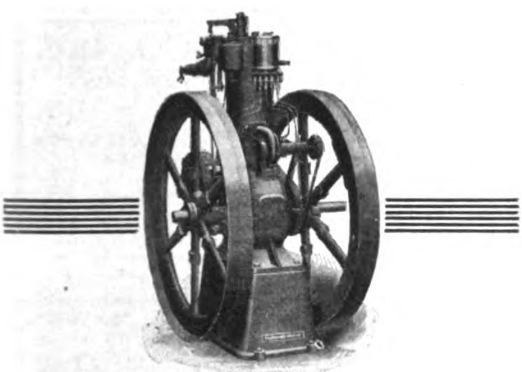

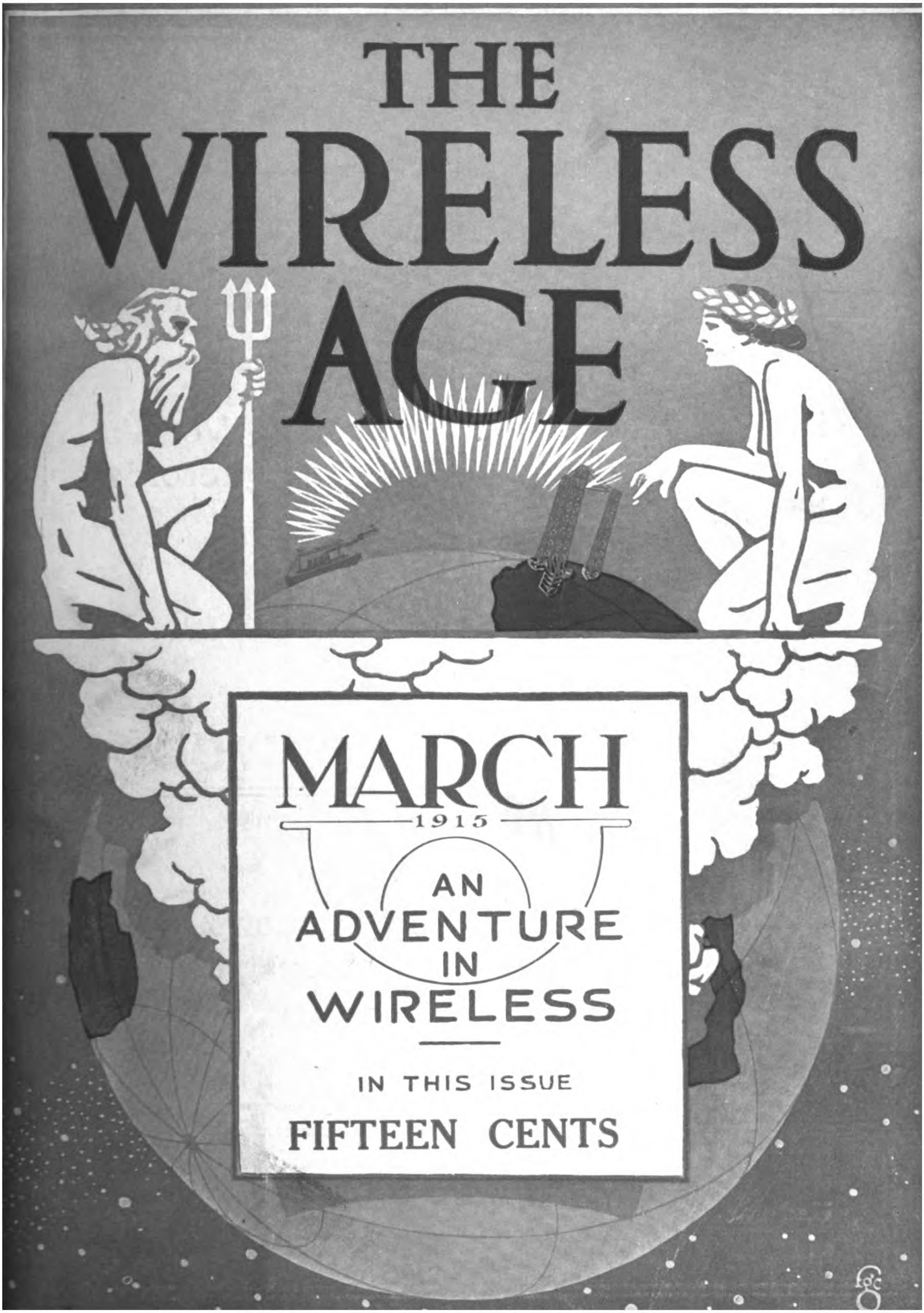
THE
WIRELESS
AGE
MARCH
1915
AN
ADVENTURE
IN
WIRELESS
IN THIS ISSUE
FIFTEEN CENTS

THE WIRELESS AGE

An Illustrated Monthly Magazine of
RADIO COMMUNICATION

Incorporating the Marconigraph

J. ANDREW WHITE, Editor — **WHEELER N. SOPER, Asst. Editor**

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CONTENTS

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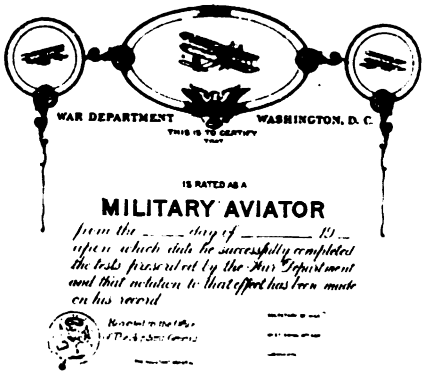

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THE WIRELESS AGE :: :: **450 Fourth Ave., New York**

THE WIRELESS AGE

MARCH, 1915

The Ownership of Wireless Equipment

¶ Should Steamships Own Their Equipments?

¶ Government vs. Private Operation

An Open Forum With an Introduction in Two Parts

Thinking, and even believing, is very far from knowing. Every thinking man does a certain amount of guessing. Particularly is this true when what we term a "popular" subject is under discussion. Opinions expressed—presumably based upon knowledge, exact, or very nearly so—often bring to the exponent a later realization that half of the substance fostering the expression was drawn from inexact knowledge, guesswork.

When conviction has been carried to hearers by this method it is almost inevitable that the speaker appraise his guess above its true value. The statement has not been disputed: it naturally follows then that the shrewd conjecture must have been a working example of a fact. The higher a man's intelligence the quicker he will recognize many instances of this kind. Offhand it may be considered that this is a harmless practice, hurting no one and adding interest to social intercourse. But it cannot be disputed that where opposition based upon exact knowledge is not encountered the speaker may sometimes convince even himself, temporarily; his conjecture may become a conviction representing his attitude on the subject.

This is one of the weak points in open discussion of an informal nature.

And that brings us to our present subject. To the best of the writer's knowledge the pros and cons of corporate or individual ownership of wireless equipments have thus far occupied the attention of interested individuals only in an incidental way; as part of business negotiations, perhaps, or a subject introduced in a social or sociable gathering.

This does not conform to the importance of the subject. If the proper co-operation can be secured THE WIRELESS AGE purposes a permanent record on the question, one which may be examined at leisure and the merits and demerits of both sides weighed carefully for the definite conclusion that lies in fact.

From the frequency of its informal discussion the topic should prove a live one. It is one of importance far above idle controversy, for it is a dollar and cents issue with steamship owners the world over and a factor to be considered in the projected American Merchant Marine.

It is hardly possible, and if possible scarcely desirable, that discussion of the subject be covered entirely by the staff of this magazine. Opinions and suggestions from outsiders are invited, wanted and needed to make this series what we wish it to be: a symposium of national significance and representative of the many interests concerned.

Part I.—Should Steamships Own Their Equipments?

WHEN a Parisian decides that he wants a telephone installed in his home he goes to a manufacturer and buys the instrument that suits his fancy. Then he makes out an installation application on a certain prescribed government form, affixes the stamp tax, secures a written authorization from his landlord, pays at

the rate of about twelve cents a yard for underground wiring, twenty to fifty dollars for his instrument, twenty dollars for the first quarter's rental, another deposit for possible long distance and telegraphic tolls—and waits a week or more for someone to come and connect up the instrument. Perhaps the Frenchman's pride of possession compensates for the inconvenience and expense—but there are ten times as many telephones in the United States as there are in France!

In this country we get better service and better terms by renting our telephones; none of us have any desire to purchase our own instruments. Yet in wireless telegraphy there are users who believe something is to be gained through individual ownership of installations.

A Distinction Without A Difference

The telegraph and the telephone—our most familiar means of communication—are owned and operated by big corporations. Buying an individual telegraph key for the commercial man's personal use is an unthought of procedure; purchasing individual telephone instruments would be considered nothing short of folly. In this country we pay for our telegrams and they are sent; we use our telephone, get a bill for rent and tolls at the end of the month and there are no repair charges added at the end of the column.

With the wire telegraph and the telephone there can be no question that corporate ownership is the better plan. Are there any good reasons then for wireless coming outside the pale of procedure existent in other communication systems?

There are advocates of individual ownerships of wireless equipment, there are steamship companies which have purchased apparatus outright; there are others which now rent and have tried both; and still others mentally see-sawing between respective advantages. On the other side, there is the Marconi Company, which stoutly maintains a rental policy is the only one. It should be of interest to determine which is the best proposition.

A single wireless instrument is of course valueless; only as part of a system of other communicating links is it of any service. It follows then that the individual equipment must be considered in its full relation to other units which make possible the transmission and reception of coherent intelligence. The individual user, therefore, whether renter or owner, leans heavily on an organized whole. This we call a commercial wireless system.

That this system exists today and makes possible "messages received for transmission to all parts of the world"—to quote the familiar Marconi sign—is unquestionably due to the one condition which some have though irksome: rental of apparatus, instead of sale.

Suppose that quick profits had been looked for in the beginning and the building up of an organization considered a too laborious method of establishing a new and strange art—where would the individual owner be today? The apparatus on his steamships would be hopelessly out of date, and—on the supposition that progress ceases when profit ends—struggling along with coherer jamming when in crowded waters. Either that, or wrecked long since by unskilled hands.

What A Basic Business Axiom Accomplished

Upon Marconi's early established and maintained general policy of renting rests the steady growth in number and efficiency of shore stations to communicate with ships and improvements in the latter type of instrument that could never have come without constant supervision over its own property. With a sales policy it would have been much as if a man built a house in a wilderness and neglected to provide a communicating highway to the civilization center. Neighbors might have been secured for the new owner by selling other houses in this wilderness, but the purchases of all would be of little value without an easy means of communication with markets and bases of supply. A neighborhood of ships connected by ether-wave paths over the watery wilderness would have followed the direct sale of equipment, but each neighbor would have been of service to the other only in cases of emergency. The connection to the shore,

to the bases of supply, was only made possible by the rental feature; and it was this shore connection that made wireless indispensable.

Perhaps the land connection might have been possible without the commercial company; the owners of the steamship equipments instead providing the funds?

Look to the wilderness community simile for the answer: Would the individuals subscribe to, build and maintain an expensive communicating link if the past had known none? if it required years of organized effort to make the public use it, and the public doubted that such a means existed? Add the final obstacle, that the individuals themselves knew nothing of construction and operation and it is readily seen what small chance there was for widespread communication ever being realized without a rental policy to pave the way to profit.

Trying to Steal a Ride on Progress

Wireless telegraphy owes its present commercial utility solely to one thing: the basic business axiom laid down by Marconi, that apparatus should not be sold and the owner left to work out his own salvation. Technical development, world-wide usage, uniformity of operation—everything that the art stands for today—find their foundation in this policy.

The ship owner of former days, had he purchased an installation outright, would have awaited the pleasure of some shore station to take his message, or it would not have been taken at all. Government regulation, the compulsory opening of shore stations to ship traffic—all this is new, less than four years old. When the Berlin Convention opened the doors to all, so to speak, steamship owners were asked to buy various types of wireless equipment. The individual ownership advocates had spent nothing to organize a system of world-wide utility, it looked as if patent license fees might be avoided by a few slight changes in construction, responsibility ceased when a sale was consummated, and with no allowance made for the expense of keeping the installation in continuous working order, an outright purchase figure could be made very attractive to the steamship man who neglected to consider operation expense and maintenance. The Marconi Company meanwhile had found the established rental rate unprofitable and sought to raise the figure. This other apparatus thereupon found some buyers, although the greater proportion of owners stood the raise.

A Surface Asset Becomes a Liability

At first glance the sales proposition may look like a good thing. Thus: A situation arising whereby the law has opened up communication to all, the outright purchase of an individual instrument from some independent manufacturer theoretically saves a certain proportion of the tolls. The charges on a wireless message being divided three ways: ship tax, coast tax and land line forwarding charges, ownership of the ship installation should permit a figurative pocketing of the ship tax proportion of the tolls.

The natural conclusion is that if a sufficient number of messages can be secured from passengers considerable money might not only be saved, but some made.

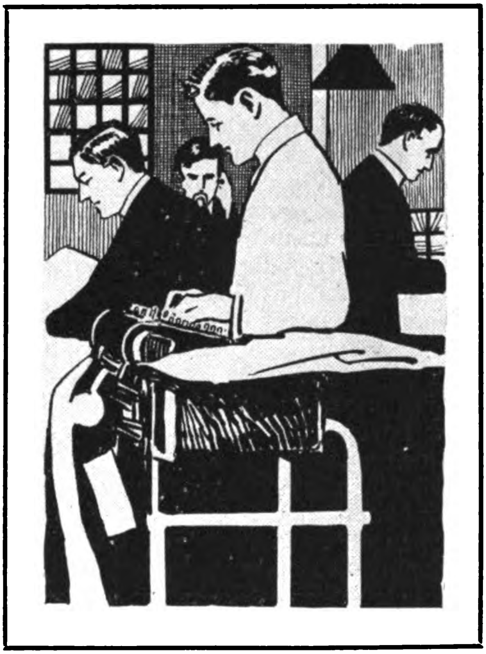
But to offset the theoretical profit is a material expense. Every message transmitted calls for an accounting with the wireless company owning the shore station and the telegraph company which forwarded the message. Skilled clerical labor being necessary to do this, prospective profits from the ship tax proportion of tolls dwindle and. on small scale operation, paid communication becomes a liability instead of an asset.

To comply with the laws that govern public communication systems certain records must be kept. The sender of a wireless message fills out a blank, pays the charges and considers the transaction completed when the message has been transmitted and received. But the agency or organization which makes this possible has to keep records, apportion

the charges and effect the distribution, adjust possible discrepancies in international accounting and follow up the simple task of delivering a message with the clerical work which is inevitably associated with any business drawing its revenue from the general public.

Some idea of what this detail comprises may be gleamed from the supplies carried by a Marconi ship operator; these include: abstracts, message blanks, proces verbal (or log), inspection report, cash statements and vouchers and requisition forms. Many permanent records have to be made and forwarded regularly to headquarters if continuous and satisfactory communication is to be expected.

Take what appears as the simplest part of the transaction, the message itself. Aside from the seven special classes of wireless messages, there are thirteen regular classes, or twenty in all. The regular messages comprise: ordinary paid message for delivery, ordinary paid message for re-transmission, government message for delivery, government message for re-transmission, master's service message for delivery, master's service message for re-transmission, franked message for delivery, franked message for re-transmission, press message for delivery, press message for re-transmission, telegraphic service message for delivery, telegraphic service message for re-transmission and ocean letter. Messages received from coast stations as well as those from the public must be written on the proper form and instructions and data properly filled in. When rates vary for different routes or various routes are available at the same rate the operator must arrange with the sender which shall be employed. He must know which countries do not admit code or cipher messages and the restrictions when they are admitted, must be able to distinguish between code words and combination words and make the proper charges: he must also be able to determine the separate charges for mixed messages of plain language and code and plain language with cipher groups. Without these classifications wireless message traffic would become hopelessly confused.



The necessity for uniform regulation becomes immediately apparent when ordinary conditions at sea are considered. If shipowners were possessed of their own plants and worked them when and how they willed the possibilities for efficient communication would be extremely small. Government regulation might control matters in crowded waters, but there is no government control that could be effective in mid-ocean. And on board ship there are no telegraph superintendents to whom an appeal may be made when in difficulties. The captain, too, for obvious reasons could not be expected to exercise supervision over this complicated branch of ship service. A central office or headquarters is an absolute necessity and fundamental economics leaves no question whether this should be under one control or scattered about the numerous shipowners' offices.

Unorganized communication between ships under the same ownership might be accomplished successfully, but what of communication between ships of rival lines or different nationalities? Without an international organization such as the Marconi Company the language difficulties, the widely varying customs of countries and nationalities and the dif-

ferences in ideas of responsibility and discipline could never have been brought under control. The regulation of ship traffic by the various Marconi companies established in each country has built up a system of international clearing houses, expediting the exchange of wireless messages, simplifying the accounting, insuring uniform working conditions and materially reducing the expense of conducting the business as a whole. The universal character of present-day wireless communication could never have been possible if these matters had been left in the hands of competing steamship lines, nor would they be conducted as well or economically if controlled at this late day by a shipowners' organization or under international government direction. Increases in staff and working expenses would necessarily follow any other plan than the present corporate control, the burden falling on the public and shipowners.

The steamship owner who elects to purchase wireless equipment outright must first perfect an organization to carry on the business properly. Whether his fleet be large or small the executive head of the wireless department must be possessed of administrative and technical knowledge, understanding thoroughly the conduct of this method of communication in all its ramifications. The salary of this department manager is the first added item of expense.

Details That Multiply Expenses

Since it is obvious that the owner of one, two, or three ships could not reasonably expect by outright purchase to effect any appreciable saving—even a theoretical one—over rental charges it at once becomes plain that the manager's time would be exhausted by preparing regulations for the ship operators, acquainting them with new traffic methods and government requirements, issuing communication charts, supervising cash accounts and message apportionment of tolls, recruiting efficient operators and providing for eleventh-hour desertions and vacancies through illness, adjusting complaints with government inspectors and refund claimants on undelivered messages, effecting settlements with foreign ship and shore stations and supervising staff requisitions, salary and bonus requirements.

No time could be devoted to inspection of apparatus and determining what is necessary for proper maintenance. At least one assistant would be necessary to attend to this branch of the work and he would have to be an engineer or a practical man of wide experience. Thus a second salary expense would be incurred.

Where the ships visited foreign ports arrangements would also have to be made for inspection and repairs there, for which, of course, adequate payment would have to be made to some organization.

By employing only operators with engineering training these inspections might be done away with, but the saving would be absorbed by the added expense on the operating payroll.

Another expense, and a very material one in some cases, would be the charge for master's messages relating to matters of navigation. The ship which owned its apparatus would have to pay full message rates for every communication with vessels of other lines, both

for direct working and for re-transmission. This would also apply to shore stations not under the same individual ownership.

Various other items of additional expense might be included here, but the ones just instanced will serve to determine that, taking it by and large, the passenger carrying vessels are better and more economically served by paying a flat rental sum. Aside from the investment of considerable sums in outright purchases, the expenses of inspection and repair, administrative salary charges, carrying reserve operators, depreciation and similar considerations, inharmonious working is a factor which would have to be given grave consideration both for the public's protection and owner's satisfaction. Under the Marconi Company's control, the burden of these problems is lifted off the shipowner's shoulders and universal wireless communication made practicable by an executive staff having the experience which qualifies it for the task.

Since many of the disadvantages originate with passengers' messages, it would appear that the cause of outright purchase is materially benefited where passengers need not be considered. Cargo vessels, for example, have the problems considerably simplified, it might be advanced. Government regulation is not so exacting, message accounting needs little consideration and expenses may be kept down in administrative quarters. But, as with the other types of vessel, depreciation and master's service messages still remain, inspections and repairs must be made and the supply of operators provided for.

The Rule Applied to Freighters

Service is the one vital consideration in the freight carrying trade. The value of wireless equipment lies in keeping owners and captains in touch with each other, saving perishable cargoes by quick relief and permitting changes in destination to take advantage of favorable market conditions. Association with organized operation and its efficient service thus becomes a particularly valuable asset.

Mention of cargo vessels serves to recall another condition which the individual ownership advocates must not overlook, whether the equipment is for cargo vessels or for passenger ships. Marconi is the inventor of wireless telegraphy and apparatus of other manufacture may involve the purchaser in legal complications.

Illustrating this point is the recent utterance of Judge Hough, of the United States District Court in New York, which forced a prominent steamship company to discontinue use of infringing apparatus and turned these shipowners to reinstatement of Marconi equipment on term contracts at the raised rental figure. When the Marconi Company had represented to the court that it had acquired and was now maintaining a large number of shore stations and that neither the competing wireless company nor the steamship owners had contributed to their cost Judge Hough maintained that the apparatus purchased was a deliberate attempt to evade patent rights and, furthermore, the Marconi Company's raised rental figure was a reasonable one. The opinion informed the co-defendants that the defence had taken "an infringing set of apparatus and so arranged or co-ordinated it as to avoid infringing."

Buying other apparatus then generally means trouble of more kinds than one; a long series of Marconi patent victories has well sustained the validity of this company's rights, and purchases from other manufacturers are almost certain to result in a court decision unfavorable to the steamship owner. Judge Hough indicated decided disapproval of such purchases in these words: "I am convinced that down to the present time the expense of operation (and of litigation) has been so enormous that complainant (Marconi Company) has received no fair return from the invention which under decisions now ruling I must hold to be of the greatest value and worthy of praise and reward."

Then it was noted that the defendant steamship company by law was "not bound to have wireless apparatus on its ships; it wants that apparatus for its

own safety and profit, and I cannot say, and indeed do not think, that a hundred dollars a month is too much to pay for a device without which it is matter of common knowledge that the insurance premiums on a large and laden vessel would be greater by more than the amount of complainant's fees."

These pointed remarks from so high an authority cover a side of the question to which intending purchasers seldom give the proper reflection. Marconi created wireless and a wireless system; the company which bears his name is the rightful recipient of reward acknowledged by the courts and the people. With the Marconi rental charges upheld as reasonable the steamship owner is confronted with a question of ethics which is aside from the discussion of theoretical and actual profits obtaining by his outright purchase of infringing equipment. American men may have the bargaining faculty highly developed, but there are few that care to lend their names to a commercial transaction which might bring them in line for a bench denunciation as co-operators in questionable business practice.

Dollar and cents considerations are not the only ones in the subject under review, however. The humanitarian aspects of wireless telegraphy are deserving of mention in their very tangible relation to an art which echoes the modern commercial slogan: "safety first."

As an aid to navigation wireless has become indispensable, as a means for saving life and heavy salvage charges its performances are monumentally noteworthy. So many and so familiar to all are the striking instances that bear out this statement, the only mention that need be made in this connection is of the significant fact that wireless—Marconi wireless—has never failed. The apparatus has always been reliable, the men dependable.

Marconi men have never failed.

There is a world of meaning in that five-word sentence. Appreciation of the wireless operator's devotion to duty has been recorded graphically in many great ocean tragedies, but the records of those silent heroes who continuously rise to emergencies and are overlooked because a mishap has a successful outcome only serve to accentuate the universal readiness of every man in the service. What is known among operators as the Marconi Tradition was created and exists in preparedness. Thorough training is another benefit accruing from a rental policy.

Individual ownership of equipment would not permit the proper preparation of men to man the wireless keys. Key manipulation proficiency and mechanical training which might be acquired in general educational institutions could not include the thorough drilling in procedure for all contingencies and the exhaustive study of telegraphic duties and ship's discipline which is made a special feature at the Marconi School. With the constant change in regulations and new conditions arising in a transitory art, the proper training can only be secured through instructors of wire experience and in immediate touch with the practical developments which determine these changed conditions.

Of equal importance with the initial preparation is the system of distributing new regulations and operating information to those in active service. The Marconi Company distributes hundreds of new orders in the course of a year and thus covers an important detail through which the individual owner avoids the possibility of costly violations and is assured of uniform and efficient service.

Granting that the individual owner might have in his employ an official with the proper experience to determine the fitness of operators it is at once apparent that a cursory investigation and a license secured through more or less stereotyped examinations is not so reliable a guide as the long period of observation while the applicant is attending the Marconi School. Nor could the necessary reserve of available operators be otherwise maintained without considerable added expense to the individual owner.

Viewing the Problem on Human Aspects

The landline telegraph operator may be recruited from any class or age since the primary requirement is speed and accuracy in disposing of messages; a boy on a farm may by code practice alone acquire equal dexterity with the student in a telegraph school. In wireless telegraphy, however, the skilful key manipulator is far from being an efficient operator. Knowledge of his apparatus, the circuits and the elementary principles of electricity are required by law and employer. Where preparation requires constructive study it is safe to assume that imagination will be aroused, and with it, ambition. It is true that there are operators attracted to wireless service solely by the romance of the sea, and these are the ones that make a reserve supply a daily necessity, but the steady plodder toward the definite goal of ambition is representative of the majority and to this class must be credited the efficiency essential to the industry. The individual owner of equipment could not hold out the inducements that the worthy material find in an organization like the Marconi Company. The ultimate reward in the service of the shipowner would be employment as expert operator, for although executive positions might be won later in the steamship offices, wireless operating efficiency would not be the determining factor. In the Marconi service the operator has ever before him opportunities to qualify for promotion to positions of manager of a shore station, chief operator, inspector, engineer, traffic official or division superintendent. That the men filling these positions today have come up from the ranks in a few years serves to spur the operator's ambition and increase his efficiency.

To secure the same efficiency without these future prospects it is at once evident that the individual owner would have to establish initial salary compensation at a material advance, and this of course means added expense.

The operator problem is a tremendously vital one in wireless service and finds its logical solution in organization based upon long experience.

Replacing Old Equipment with New

Earlier in this article passing reference was made to the improvement in apparatus effected through the Marconi rental policy. Every so often those who are not familiar with the many details which in combination make up an efficient wireless service are moved to criticise all apparatus that does not include every refinement of the moment. When the design of the equipment on one ship is compared disparagingly with another because it is not the very latest production, the wireless service is not being considered—type and power of single installations do not constitute wireless service.

Unquestionably the latest equipment is desirable, but it is not always prac-

ticable to supply it. A good wireless set costs a considerable amount of money. Improvements are made not only from year to year, but from day to day. It is not to be expected that with every new development the Marconi Company can afford to replace equipment which is giving satisfactory service. The individual owner would not do this, nor would he consider it necessary to give the older apparatus the minute inspection and careful attention which the Marconi inspection system makes a matter of routine. A steamship man looks upon wireless equipment from a business standpoint; if he owned it by outright purchase and it complied with government regulations and was giving satisfactory service the announcement of some little improvement wouldn't be sufficient to make him discard it for a new and expensive set.

Individual ownership of equipment would not only have retarded the progress of the art, but would have lowered the standard of apparatus. Many steamship owners who were not required by law to install an equipment would have considered the heavy investment represented in initial purchase and have decided to get along without wireless. Others who were affected by the regulations and whose business was conducted on a small scale would purchase the minimum equipment necessary to comply with the law and view it as they do lifeboats, adequate for present use until the inspectors notify them differently.

The Reason for the Weeding-Out Process

The other side of the question reveals the Marconi Company making every effort toward continual improvement in service and equipment. Scores of new devices and alleged inprovements are being constantly examined and tested, discarded and adopted, according to proofs of efficiency. It is a business proposition; a service organization depends upon its reputation for continued patronage and would find it poor economy to continue with apparatus obsolete or inefficient when the whole system may be benefited by the gradual substitution of improved equipment.

Humanity's Debt and the Obligation

Having confined this preliminary discussion thus far to considerations of expense, convenience and utility to steamship owners, a thought or two on another phase of the rental policy should be acceptable. There is no deprecating the value of wireless, nor humanity's debt to Marconi. The organization which has been built up about his name and efforts is deserving of proper financial reward. Otherwise there can be no gratitude, nor, indeed, can there be any spirit of fair play. Those who showed their early faith by lending financial support, too, are entitled to a fair return on investments and the more permanent income represented in rental policy is the only one which can make this possible. Both inventor and investor have been extremely patient through a long series of court proceedings arising out of the cupidity of frenzied financiers and their get-rich-quick exploitation of wireless telegraphy. It has taken many years and many dollars to have the validity of Marconi's claims upheld by courts in all countries, and clear the field for proper development. Meanwhile, the parasites have been dissipated, some to jail and others to oblivion. But at what cost to progress!

Fifteen years ago the Marconi Wireless Telegraph Company was incorporated in this country and for the first three years of its existence so tied up in patent litigation that commercial advances were out of the question. In 1902 but four shore stations and four liners were being operated with the American equipment. Two years later only two ship equipments had been added, and up to three years ago there were operated but ten land stations and fourteen ships, five of which were yachts. Continuous patent litigation and competition at ruinous contract rates from wireless telegraph com-

panies organized for looting had arrested expansion up to this point. Then the bankruptcy courts and the federal authorities closed in on these competitors, and clapping their moving spirits into jail left the field free for proper development.

In the three years which have since intervened the American Marconi Company has increased its ship and shore stations until the total now reaches approximately 500. Including the new trans-oceanic plants recently completed there are now 62 shore stations fully equipped, and messages transmitted in the course of a year run into millions of words.

The successful operation of a system of this magnitude and the advantages of international affiliations of equal strength have made the Marconi Company of to-day a great commercial institution, worthy of the boon to humanity it represents and typifying progress and ultimate reward to the loyal supporting public.

With its rental policy proven economical, its charges fair and equitable to steamship companies, and its service reliable, there can be no question that ship wireless equipments are better operated by one control than by individual ownership.

PART II—GOVERNMENT VS. PRIVATE OPERATION

SHORTLY after the conception of these initial articles a member of the editorial staff of The Wireless Age made a short sea voyage in an unofficial capacity. During the trip he engaged two fellow passengers in conversation and without any suggestion from him they gradually led the general discussion of timely topics around to a consideration of wireless telegraphy from the public's viewpoint. The magazine man did not disclose his identity or his connection with the subject under discussion. Except where pressed for an opinion he remained silent, content to add a word here and there when by supplying a trifling bit of information new impetus was given to what later developed into a controversy.

The two ship acquaintances were representative men. One was the sole owner and manufacturer of a widely known household specialty, the other a special investigator for a financial reporting agency.

Once the romantic and humanitarian aspects of wireless had been disposed of the talk took on a more commercial tone and the usual dissection of communication processes followed. The manufacturer was of the distinctly modern type, aggressive in problems of marketing, an experienced campaigner and an unusually deep student of production efficiency. The other was of a more judicial turn of mind with a broad appreciation of commercial factors by virtue of his calling.

In time they began to speculate on the effect of legislation on commercial wireless business and hazarded an opinion or two as to whether the effect was good or bad. They came to a deadlock finally when the manufacturer heatedly exclaimed: "I suppose it is the same with this business as it is with any other—too much Congress! Business should be let alone in this country. We make laws too fast. Granted that in the past a few big corporations abused privileges, does that mean the public mind should be filled with apprehension and every manufacturer be suddenly confronted with the fact that it's costing him more money to get business than ever before? Half of this commercial uplift is misdirected. Sanity in law-making is what we need.

"Busniess is dull. Why? Not because of the war. My factories are running night and day. But I am not making the legitimate profit. And simply because the Government is trying to run my business!"

The other did not agree with him. He believed big business did not suffer through supervision from Washington. And as the first speaker was equally positive that the benefits were over-

shadowed by the damage done, the argument waxed hotter and hotter. They were both strong men and staunch supporters of their respective opinions. Denunciations became more violent and suggested remedies more radical as they plunged deeper into the subject. Then, as suddenly as it had begun, both stopped short in the midst of the controversy. The slow smile that spread over the features of one was reflected in the face of the other.

"We have drifted rather wide of the mark," began the agency man, "you know, we started out to discuss wireless . . . Now here is a business in which I believe Government supervision, direction—ownership even. . . ."

And he went on to review what he considered the merits of federal control of wireless, along with the telegraphs and telephone. At first the manufacturer did not agree with him. Gradually, however, he recapitulated and under the other's tuition began to see positive benefits—not for his business of course, but, when he stopped to think it over, "quite a logical thing for wireless."

This, to the silent wireless man, was a truly amazing expression. Less than an hour before a highly intelligent manufacturer had been bitterly scoring the legislators because of interference with the conduct of his business That opinion he still held; and it was safe to say nothing could change it. Yet on the say-so of a chance acquaintance he had modified his views on the question of wireless solely through accepting as facts a series of half-truths which the other had picked up here and there.

There can be no question that the advocate of federal ownership was sincere. He was painfully so, with the ring of conviction in his voice that has ever made a little knowledge a dangerous thing. Which, to a man who knew the true particulars, and the accurate figures covering the details he mentioned, made it startlingly apparent how public opinion may hinge and actually be swung on little discrepancies.

If the speaker had been required to set his arguments down in writing he would have verified his details; but no record of his conversation was being kept, his opponent had little or no knowledge of the federal ownership propaganda and conjectures became convictions in the easy freedom of unrecorded speech. And what was the result? A fairly influential citizen was given the groundwork of what may later develop into a definite attitude on that particular subject.

The Most Successful Instance on Record

This rather lengthy preamble has been set down for two reasons: first, to illustrate the value of committing our present discussion to the printed word; second, as justification of the writer's opinion that government ownership is necessarily one of the considerations to be taken into account.

If the lay public gravitates unassisted to that phase of the subject in a general discussion of commercial wireless it is reasonable to presume that one of the first suggestions in a consideration of Corporate vs. Individual Ownership would be: Why not the compromise—government ownership?

Let us therefore consider this question first.

All good arguments are founded on

fact. The most obvious comparison in favoring federal operation of wireless is the British Post Office's management of the kindred industry, the telegraph. This is one of the most successful instances of government ownership on record, the one quoted by the writer's ship acquaintance and the inevitable basis of discussion when the subject is introduced.

For forty-five years the British Government has had this monopoly and, similar operation of wireless telegraphy not being known, its wire telegraph record is the logical basis for whatever conclusions may be drawn through comparison.

A message of twelve words is carried anywhere in the United Kingdom for sixpence (twelve cents), the minimum charge; additional words being charged for at a half penny each. Both address and signature are counted, however, and these, say American telegraph companies, average fourteen words. A ten-word message, as we know it, is therefore a twenty-four word one in England, costing twenty-four cents.

This charge is certainly below American figures, but there is of course the difference in distance of transmission to be considered.

All England is within about six hours' railway journey from London. The telegraph business is mainly between the large cities and there is no legal liability for errors or delay in transmission of messages. These two factors, and particularly because the traffic is what we would term short line business, greatly affect the rate.

To illustrate this latter point is the case of J. G. Smith and G. S. Mott who organized the Commercial Telegraph Company about thirty-five years ago, maintained service between New York and Philadelphia only, and found it profitable.

Seeking a parallel for present-day short line business between New York and Philadelphia the service between London and Manchester will be found just as good and cheaper than ours. But consider the difference in maintenance charges necessitated by a service throughout the three and one-half million square miles of the United States as against that of England proper, with one-seventieth of that area or acreage less than the single state of Alabama.

Foreign Rates and Comparisons

How important this matter of distance becomes is revealed by a careful examination of the tables of rates not only in England but throughout Europe. The figures are misleading in ways other than the word count.

In an address recently given before the National Civic Federation in New York it was pointed out that a message going any appreciable distance in Europe passed through more than one country and the rates as given were "split up" on cost; that is, a single message passing through two countries is counted as two; if it passes through three countries it is made to count for three messages. If this same condition prevailed here it would be much as if a message from Massacusetts to Pennsylvania counted as three messages, with the state cost divided so that the rate appeared as one-third of what it really was. Taking the charge for address and signature into proper consideration again and glancing at communication conditions over longer distances we find that for the 1,000 miles between Stockholm and Paris the message rate is 72 cents, while from New York to Chicago, about the same distance, the 10-word rate is 50 cents.

On the whole, then, it is possible that exhaustive investigation would reveal the cost of telegrams to the active trader is really higher in Great Britain than in the United States.

For the sake of argument, however, let it be granted that telegraphing is cheaper than with us. Because less money in charges is passed over the counter it does not necessarily follow that the public finds telegraphing cheaper in the end.

The British Post Office report for the yearing ending March 31. 1913, shows that the loss for the twelve months was $5,723,940. The following year it was a little more. The year before it was over

six million dollars. An average of the last few years shows an annual loss of five millions.

Yet it is reported that under the former private ownership the system showed an average annual profit of $1,600,000.

Since the British nation took over the telegraphs in 1870 the loss is estimated at $200,000,000.

Some contend that this loss—which the taxpayers have to bear—is more than offset by the cheaper rates.

But are the rates really cheaper?

And if they are who is benefited? The bulk of the message is sent by the bankers, the merchants, the manufacturers—about 10 per cent. of the population!

The government-owned system pays no taxes. The private corporation does.* Not only does the privately-owned system pay its stockholders dividends from profits, it furnishes a source of revenue to the government in place of being a very material drain on the nation's treasury.

Take it from another viewpoint: In England the annual expenses of the telegraph system are thirty to forty per cent. more than gross receipts. This means that the charges for a message pay for only two-thirds of the service. The public treasury—the taxpayer's money—has to make up the one-third difference.

This condition remains after forty-five years' experience, during which time the message traffic has increased nearly tenfold. The post office has grown up in the telegraph business and still loses money on every message it sends. The American telegraph companies, on the other hand, show a profit as private corporations, charge little if any more for service, even under immeasurably greater geographical problems, and are a source of revenue to the nation instead of a burden.

Consider also that Great Britain's operation of the telegraph is the shining light held up by advocates of government-owned systems. Admitting all their favorable contentions—which most emphatically should not be done—it is still rather difficult to see how even this theoretical success is any guarantee of Great Britain's, or any other country's, success in wireless, an infinitely more difficult business. The monumental fiasco attendant upon government operation of the British telephone contrasted with its amazing success under private control in the United States would furnish a fair comparison, if the details were not too painful for disclosure.

In all of England's experience with publicly-owned means of communication, therefore, there is nothing to base an argument on for government ownership in the United States.

Small Likelihood of Government Wireless

Government-owned wireless systems for ships are unknown as yet, and will no doubt remain so, for it is reasonable to suppose that the legislators of many nations have recognized that where governments operate telegraph systems after years of experience and show a loss while private ownership shows a profit, wireless, a new business and a difficult one, would prove many times more unprofitable under federal operation.

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* U. S. Department of Commerce, Bulletin 123 (1914), gives latest available figures, the year 1912 showing land telegraph systems paid in taxes and interest, $2,740,827.

In association with the type of citizen mind that leans blindly toward government ownership is the much-abused and greatly misunderstood word "monopoly." With the hysteria of the muck-raking days still fresh in the memory of the people anything bearing a resemblance to control of an industry is vaguely condemned as a subject for federal intervention. Even though a rational period has since come and discredited indiscriminate attack much of the old "down with the big fellow" spirit still obtains with the light thinkers.

Monopoly's Relation to Efficiency

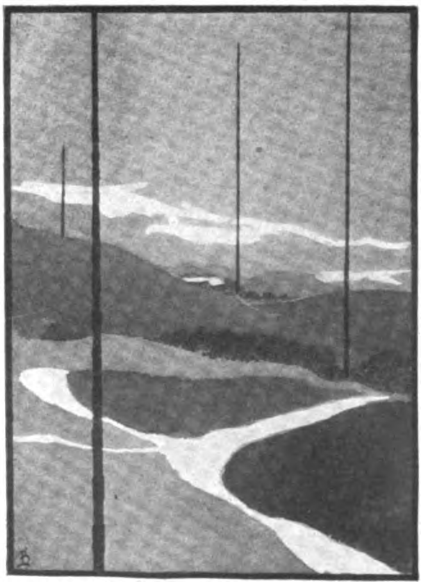
Certain, if not all, public utilities—under which heading wireless logically belongs—are natural monopolies. Full appreciation of this statement can only be arrived at by a lengthy economic dissertation, which has no place in this article, but consideration, from a service point alone, of that thoroughly dependable social and business asset, the American telephone, will supply more than sufficient material to settle the question. And an incidental trip to any important city in Europe will end forever any doubts as to the undesirability of government ownership and the merits of monopoly control in private hands.

Monopoly in a publicly used communication system invariably produces efficiency. The very largest corporation and the keeper of a country store are much in the same position: both have to please their customers. Otherwise the public will buy as little as possible, and there is no money in that. Whether it is a can of tomatoes or a wireless message the purchaser expects prompt delivery of exactly what was ordered, and if he does not get it more money will be spent for the same thing only when it is absolutely necessary.

Service pays. Big business recognizes that. The increasing popularity of the telephone in this country carries a heavy lesson to other nations. New York City has more telephones than six European countries taken together—Austria, Italy, Belgium, Norway, Denmark and the Netherlands. Chicago has more telephones than the whole of France. New York City equipment alone is only 200,000 short of the number of telephones throughout the whole of Great Britain and Ireland. The telephones of the civilized globe added together total about 14,000,000. More than seventy per cent., or 10,000,000, are in the United States.

Americans consider the telephone indispensable, other nationalities look upon it as an aggravation. Its popularity is attested by the growth in this country to the staggering number of 10,000,000 instruments in use to-day, against 650,000 fourteen years ago. In point of equipment England stands to-day exactly where we stood in 1900.

Any American business man who has had occasion to travel on the continent knows how infinitely superior our service is, how much better it is operated under private control than are those run by governments. Monopoly is no longer the bugaboo it used to be. It is gradually becoming recognized that it makes for better service. An industry controlled by a private corporation must make money or go out of business. Taxpayers will not make up the deficit. Good service means growth, poor service stagnation. And because the public utility's profit is proportionate to its popularity the constant aim is for progressive support, secured only through continuous betterment. It is now generally recog-



nized that the size of the corporation is not necessarily a menace. President Woodrow Wilson reflected the new order of thinking when he said: "I am not jealous of the size of any business. I am not jealous of any progress or growth no matter how huge the result, provided the result was indeed obtained by the processes of wholesome development, which are the processes of efficiency, of economy, of intelligence, and of invention."

And it is with exactly this—wholesome development through efficiency, economy, intelligence and invention—that the Marconi Company has qualified for commercial preëminence in the field of wireless communication.

What This Article Means

In the foreword to the article finished just above an invitation was extended to every person interested to give their views on the questions it covers. It is the intention of THE WIRELESS AGE to publish the best of the arguments on both sides, with or without comment as the contribution demands. No one is barred from participation and a place will be found in the open forum for every presentation which has something to say. This does not mean that all communications received will be published, irrespective of value. Only those that argue the question with sincerity and are based on careful study or practical experience—that reveal sound reasoning and a viewpoint—will be considered. Shipowners, commercial wireless men and those in government service, scientists and economists are especially invited to consider the subject, addressing Open Forum, THE WIRELESS AGE.

At the Front With Wireless

The fight between the forces of the Germans and the Allies for possession of a station in German New Guinea—An Operator's story of the naval battle off the Chilean coast—Other details of the European War

THE wireless station on Kaiser Wilhelm's Land was one of the chief bones of contention when a large Australian and French force invaded German New Guinea. A comparatively small number of men under the command of Dr. Eduard Haber, formerly governor of the colony, blocked the plans of the invaders for a day, but they were finally compelled to retreat. This was the story told to a newspaper reporter by Dr. Haber when the latter arrived in New York City recently.

He had only arrived in the colony from Germany in April, and was on a tour of inspection when the wireless caught him far away in the wilderness and spluttered forth the word war. The wireless station on Kaiser Wilhelm's Land was in communication with four other wireless stations scattered on outlying islands which, in turn, reached a station on the Australian mainland. On September 2 the station at Mauru went out of commission and shortly after that the station at New Pommerania. Dr. Haber gathered from this that something was the matter and that the allies might be approaching.

His surmise was correct, for from Rabul, where the seat of government was located, a battle fleet was sighted at four o'clock in the morning of February 11.

When it approached, the residents of Rabul noticed one Australian dreadnought, three cruisers, six torpedo boats, two submarines, one troop ship, which carried, as was later ascertained, 2,200 Australian marines; one French cruiser and a galaxy of transports and coal ships.

This fleet cast anchor and a demand was made for the surrender of the German colony. Dr. Haber defied the invaders and declared that he, as German governor, had no authority to surrender anything. Then they demanded possession of the wireless station. This request, too, Dr. Haber refused. He then prepared with his hundred native Germans and several hundred native constables to repulse the attempted landing of the marines.

The Ruban forces were at first successful, but as they had no heavy artillery and were not even equipped with machine guns they had to give up in the end. So, leaving half of his complement of native Germans in Rabul to look after the women and the official papers, he hurried with about a hundred natives and fifty Germans and went to the wireless station on Kaiser Wilhelm Land with a view to saving it from capture and possible destruction.

Dr. Haber's men held this for a day, but when reinforcements arrived to attack them they had to retreat. They intrenched themselves in a section of the country which was barren and practically unexplored, keeping up an incessant fire with their rifles to convey the idea that they were in large numbers. After a time the Australian commander asked for a parley and, acting on the belief that Dr. Haber's force was considerable, agreed to guarantee safe conduct to all officials of the colony to Germany without a binding promise that they were not to fight after reaching the fatherland.

Further details of the sea fight between British and German war ships off the Chilean coast in which the Good Hope and the Monmouth of the English fleet were sunk are contained in a letter written by Maurice Scott, wireless operator on the British auxiliary cruiser Otranto. It is in part as follows:

"We sighted smoke about 4 p. m. and, having heard loud German wireless signals, knew it was the enemy. Our squadron formed into battle array, and it was a fine sight to see our ships, each flying two white ensigns and the Union Jack, going into action. The enemy had two armored cruisers of a bigger and much superior type to the Good Hope, and two light cruisers. Our guns were so small as to be out of range, and the Glasgow tried to bring her small guns into action. Firing began at 7:15, and after ten minutes the admiral signalled for our skipper to go, saying it was the best thing we could do. We were a big target and gave them an easy range-finder. It was, of course, useless for us to go close in; we should have gone under with the first shell.

"They fell all around us those first few minutes and it was a miracle we were not hit. Our three put up a splendid fight, and it nearly broke the captain's heart and, in fact, that of everyone on board, to see them beaten, being unable to do a thing. Both the Good Hope and the Monmouth took fire and we fear both are lost with all hands. The Glasgow had three holes put in her, but escaped with four wounded.

"It lasted fifty minutes, and no one can possibly imagine who has not seen it how awesome and ghastly it was. Sir Christopher Cradock was our admiral, and I shall never cease to respect the way he went into action. He was a Yorkshireman. The merchant cruisers were, of course, not meant to go into battles like that, but it was awful to have to run away from the others and leave them to it. I would love to be in the scrap when the Scharnhorst, Gneisenau, Leipzig, and Dresden are sunk. It's an awful thing to wish from the humane point of view, but we would like to get our own back for the Good Hope and the Monmouth."

Newspaper dispatches from Corunna, Spain, relate that a man on the French line steamship La Champagne which recently arrived in that port from Mexico, planned to blow up the ship, but his plot was frustrated by a wireless message of warning sent to the vessel. The man suspected of being responsible for the plot, was arrested by officers of the steamship. He is believed to be a German. The officers declared that they found five dynamite bombs in his trunk.

The use of wireless apparatus in German waters by merchant ships except in case of distress has been forbidden by the German imperial marine authorities, according to an announcement made in Washington. Ambassador Gerard at Berlin has cabled that the rules governing wireless provide that after a vessel has entered German waters and taken on board a German pilot that vessel is under the control of the German authorities and the radio apparatus is to be locked and not to be unlocked until the German pilot is discharged after passing Rotorsand Lighthouse. In port wireless apparatus is to be partially dismantled and certain parts of it turned over to the German authorities until the vessel is ready to leave.

A Tribute to a Co-Worker

E. J. Nally, vice-president and general manager, Marconi Wireless Telegraph Company of America, has received a reply to his letter to Loren A. Lovejoy, which was published in the February issue and commended the operator on his devotion to duty in the wreck of the steamer Hanalei.

Mr. Lovejoy says: "It is needless for me to try and say how much I appreciate such letters, and am only too sorry that my assistant and co-worker, Mr. A. J. Svenson, is not here to share them with me, as a braver and truer boy never pressed a wireless key. I cannot commend him too highly for his work and behavior during those trying hours, and if there is a place in heaven for men of his type who show such unselfishness he will surely reach there."

WIRELESS IN AERIAL STRATEGY

At a meeting of the Aeronautical Society of America, held recently at its headquarters, No. 20 West Thirty-ninth street, New York City, E. E. Bucher delivered an address on the wireless phase of aerial strategy in war. This was followed by an open debate.

S O S By Flash-Light

How the appeal for aid, spelled out in the darkness by Waale, wireless man on the wrecked oil ship Chester, was received by Operator Moore on the Philadelphia which rescued the crew of the tanker

William V. Moore, second operator

First Officer Lyon

J. Edward Jones, first operator

THE disadvantages of being without wireless telegraphy on the sea and the advantages of having radio men at hand when the waters are reaching out for their prey are illustrated in the accounts of the wreck of the oil tank steamship Chester. The Chester, with her superstructure destroyed by the waves, drifting where it pleased the seas to hurl her, was not equipped with wireless. She did have among her officers, however, one, Waale, who holds a cargo grade wireless certificate. All of the signal lights except one having been saturated with water, it devolved upon him to send out the S O S by flash-light.

While the Chester's men were waiting and hoping for rescuers to appear the steamship Philadelphia was making her way unknown either to her commander or to that of the tanker toward the wreck. And through good fortune the steamship reached a point within a few miles of the Chester—so near in fact that the officers of the former saw Waale's S O S spelled out in the darkness.

On the Philadelphia were Marconi Operators Jones and Moore. The latter, summoned to the bridge to respond to the signals of Waale, received the messages which told of the hopeless fight the Chester's crew had made against the sea, and informed the men on the wreck that the liner would "stand by." And she did "stand by," the entire ship's company of thirty-three men being transferred safely to the Philadelphia. First Officer Lyon was in charge of the rescue life-boat when it made its second trip to the Chester. He is known among wireless men as the inventor of the cerusite detector.

Laden with a cargo of oil, the Chester, owned by the American Petroleum Company, left New York on January

23 bound for Rotterdam. She had been out of port only a few days when she ran into rough weather. Then a tank bulkhead burst, the pressure of the oil opening the decks. But it was not until February 2 that Captain Herman Segebarth, the commander of the vessel, and his men began to have any misgivings regarding the safety of themselves and the ship. On the afternoon of that day the waves increased in size and one of them—a giant roller—swept over the vessel, leaving a train of damage in its wake.

On the bridge at the time were Second Officer Jacobus W. Waale and a quartermaster who was at the wheel. They were caught up in the deluge which threatened to hurl them over the sides. Captain Segebarth, who was in the chart room when the wave struck the vessel, was shot to a point not far from the second officer and the quartermaster. After the men had regained their feet they took account of the damage and found that almost everything on deck, including the life-boats, had been swallowed up by the waters. Three men were thrown from their bunks and injured.

Captain Segebarth gave orders to pump out two of the oil tanks in order to keep the seas from wreaking their full fury on the Chester. The men were spared this task, however, for some of the hatches had been demolished and the oil was pouring out of them in large quantities.

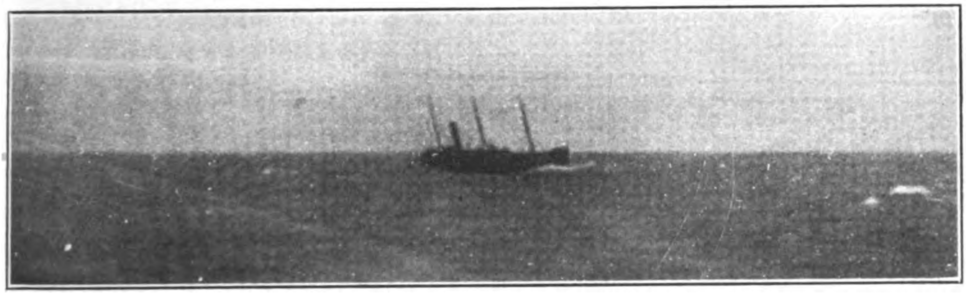
As the day waned conditions on the tanker became worse. The bunkers having been flooded, the engines were stopped and the vessel fell into the trough of the sea, listing so heavily to port that her rails were in the water. Darkness found her tossing about at the mercy of the waves and the members of the ship's company wondering how long she could withstand the terrific pounding of the seas.

In this emergency Captain Segebarth turned to Waale for assistance. The second officer held a cargo grade wireless certificate and was therefore familiar with the Morse signalling code. The little band on the wave-battered craft looked to him therefore to bring aid by sending out S O S by flashlight.

All that night the Chester was driven by wind and wave, while Waale directed the rays from a lamp over the waters, ever spelling out S O S, but there was no response to his appeal nor to the one signal light that remained undamaged by the water. Dawn broke with no signs of rescuing craft in sight. Flag signals of distress were hoisted, but they were unfurled in vain and night again found the vessel drifting about aimlessly. Again Waale sent out the flash-light signals, while the ship's company waited

The Philadelphia, whose timely arrival at the scene of the wreck was the salvation of the tanker's crew. She, too, met with heavy weather, having encountered severe storms when she was only a few days out of port

In this photograph the members of the crew of the Chester are shown after they had recovered from their trying experience on the storm-racked vessel. They were snapped by the camera on the decks of the Philadelphia, one of the men being pictured with a cat, which claims the liner as its home, clasped in his arms



A photograph of the Chester which was taken as the Philadelphia steamed away. The wrecked ship was set on fire after her crew had been rescued in order to do away with the danger of other craft coming into collision with her

anxiously for a reply. But none came. And finally the men on the Chester were compelled to abandon hope almost entirely. They knew that the vessel was on the northern route—a path which is used by few vessels at this time of the year—and that only good fortune would put them in the way of another ship. But Waale, despite the desperate odds which the Chester's people were facing, continued to flash his signals over the trackless waste. This was the situation on the tanker early on the morning of February 4.

In the meantime the American Line steamship Philadelphia was making her way across the Atlantic bound from Liverpool to New York. She, too, met with heavy weather, having encountered a severe storm when only a few days out of port. The weather conditions were such in fact that the liner on one day steamed only sixty-six miles. Her average rate of speed is 450 miles a day.

The Philadelphia was in the mid-Atlantic on the northern steamship route about one o'clock on the morning of February 4. Captain Arthur Mills, her commander, had chosen this path instead of the southern course in the hope of avoiding the weather conditions reported to prevail on the latter route. It was while the Philadelphia was feeling her way through the night under an overcast sky that a light so small that it seemed no larger than a spark was sighted. As the liner neared the light it became evident to her officers that a vessel was signalling the Philadelphia. Third Officer Ellis had some knowledge of the Morse code and after a while he was able to make out the letters S O S.

In charge of the Marconi equipment on the Philadelphia were First Operator J. Edward Jones and Second Operator William V. Moore. Jones was going off duty when Captain Mills telephoned to the wireless cabin from the bridge, asking him to attempt to establish wireless communication with the craft. So Jones sent out a general call—CQ—and followed it up with the query: "What ship is that abeam?" Those on the Philadelphia were not aware, of course, that the vessel with which they were attempting to communicate was the Chester and that she had no wireless.

Captain Mills and his officers in the meantime were making preparations to respond to the signals of the Chester by means of the Philadelphia's Morse lamp, Moore being summoned to the bridge to operate the light.

"What is the matter?" was the first message he flashed. It was almost thirty minutes before he received a reply. Then, Waale, from the rocking deck of the Chester, responded that "We are a wreck." He also repeated the S O S call several times. Little by little those on the Philadelphia gained a rough idea of the plight of the men on the Chester. The Chester had no boats, Waale signalled to Moore, in response to the latter's question. And finally, in answer to the query of the Philadelphia's operator, "Do you want to be taken off?" came a jerky, nervous "Yes," every flash of Waale's lamp seeming to emphasize the hopeless predicament of Captain Segebarth and his men. To these signals Moore responded that the Phila-

delphia would "stand by" to take off those on the wreck.

It was not an easy rescue to effect, however. Tremendous seas were running and Captain Mills, fearful that his ship would be imperilled by the drifting hulk, kept the steamship a mile and a half away. It was a matter of conjecture, too, whether a small boat could live in the rough waters. So Captain Mills called for volunteers to go to the wreck in the port emergency life-boat. Chief Officer Candy and five seamen jumped into the craft from the boat deck and, one more man being needed, another seaman volunteered. Considerable skill was displayed in the launching of the boat. The men in charge of this task waited until the Philadelphia rolled heavily to port with the waves before lowering it from the davits. Then, by degrees, it was slid toward the water, and thirty minutes after the call for help had been received it was on its way toward the dancing light which indicated the position of the Chester.

As the life-boat pulled away from the steamship, Moore again flashed his lamp, signalling "Boat now leaving. Look out for it." From Waale's lamp came a few flickers, acknowledging the message.

In the small boat Candy's crew battled with the waves for a long time before they were able to get within hailing distance of the wreck. First they went to the stern of the ship and then to the windward, finally arriving at a position on the lee side. All of the rescued men were compelled to jump into the sea, from which they were pulled into the life-boat by means of a line. This was fastened to the life-belts of the wreck victims and, with the Chester's people holding one end of the rope, and the other in the hands of Candy's men, the members of the tanker's crew, one by one, plunged over the side. In this manner twenty-two men were transferred to the life-boat.

The pull back to the Philadelphia was no less full of peril than the trip to the wreck. The seas washed into the boat, some of the men being constantly engaged in bailing. The rescued huddled in the bottom of the craft until it reached the steamship when they jumped for the rope ladders thrown over the sides. This method of getting them to the decks of the vessel was found to be perilous, however, for some narrowly escaped being crushed between the life-boat and the steamship as the two were lifted on the crests of the waves; others mounted the ladders only to be blown about by the wind at imminent risk of losing their grip on the ladder and falling into the sea. It was found necessary, therefore, to fasten a rope around each man and pull him to the deck.

But eleven men, including Captain Segebarth and Waale, still remained on the Chester. The boat of which Chief Officer Candy was in charge had been gone two hours, only making the trip and effecting the rescues by the exercise of the most skilful seamanship. It was now half filled with water and the stories told by Candy's men of the difficulties and dangers encountered on the trip gave those on the Philadelphia a vivid idea of what it meant to be afloat in the mountainous waves in a small craft.

There was another call for volunteers, however, and First Officer Lyon went in charge of the boat. It met with much the same battering from the seas that it underwent on its first trip. Lyon found that the Chester was still listing heavily and was standing high out of the water. Captain Segebarth and the others were waiting for the boat, but before they left the Chester they set the vessel ablaze in order to do away with the danger to other craft. This having been accomplished, the boat set out for the Philadelphia. The trip was perhaps more hazardous than the pull back to the steamship made by Candy's men, for the life-boat was now so wracked and pounded by the seas that she was hardly seaworthy. So, after it had reached the Philadelphia and the last man had gained the decks of the vessel, the boat was dropped astern where it was broken into pieces by the screw of the steamship.

The liner then proceeded on her voyage, a cloud of smoke marking the position of the Chester. As the Philadelphia steamed away a wireless message was sent broadcast telling of the location of the wreck and warning the commanders of east-bound steamships regarding it.

The Nigger

By C. H. Claudy

THE chief stood in the bow and spat into the gray-green water below. The sky was an angry glare to the west, and the air was hot and humid. Above, a feeble star tried to shine through a murky haze, and failed. To the east the horizon was barely visible, a clean black line against the purple of a sky that said nothing aloud, but whispered of evil things to those who read the signs of trouble at sea. In the engine room was the only sound in the ship—the steady chug-chug-clank, chug-chug-clank of the two engines. The glass was down—way down, although the chief knew this only by inference. Nor did he care greatly. It was the captain who was caring, and who watched the mercury dropping, dropping—slow, it is true, but still dropping—and who saw, with more than the usual anxiety which a falling glass has for a careful skipper, the strongly marked concavity of the surface of the mercury, which bodes ill for ships not strong of heart and stout of timber and brace.

The chief stood in the bow and spat into the gray-green water below. It is a peculiar combination of circumstances which can throw a five-hundred-ton tramp into the hands of her chief and one uneducated nigger for an engineer's force, but the circumstances had occurred. The Minnie Woolworth—"Woolly" for short—never had but two engineers, in spite of her two compounds, for her owners were the saving kind, and two engineers instead of three saved not only salary, but "hash" for one. Nor had there ever been any occasion when the two were not ample for the work. A tramp runs on no schedule, she gets where she is going the best way she can, and whenever she can, saving coal by the law of necessity, which loads the bunkers with only enough to get there plus ten tons margin, and which prescribes two knots under the possibility of the screws as a result. Beck, the chief, and Andrews, the second—who had somehow managed to learn to work the dinky little coherer wireless set with woeful irregularity of signals—stood watch and watch, and thought it little hardship.

But now here was Andrews tied in a hard knot in his berth with something he called cramps (the captain was deadly afraid it was ptomaine poisoning) and as much good as a jellyfish as far as standing watch was concerned. Wherefore the Nigger had been called from the stokehole and took his place every third watch—while Beck was standing eight hours with four hours below.

The Nigger was lazy. He was a product of the West Indies, a man of immense physical strength, with the poetry of the beasts of the jungle in his lithe strong body, his swelling muscles, and the clean clear bronze of his skin. He was a typical, happy, careless child of his race, living only for to-day, for the next meal, the next sleep, loving the sunlight like a cat, and hating the wet and the cold as do the transplanted children of the Line. Somewhere he had picked up a knowledge of engines and steam. He could throttle her down if a sea made the big slow screws spin like pinwheels, could watch her water and her steam, and give orders to the stokehole with unnecessary pride, could pack a valve or oil a bearing as well as Beck himself. But he could not read nor write; and, when it came to even such ordinary tasks as taking a card or setting an eccentric valve, he was as much at sea as any one who has never learned anything of engineering but by observation and absorption.

Still, he was the only man in the stokehole who knew even so much, and when the captain had a despairing talk with Reddy, boss of the grimy stokers, the Irishman indicated the Nigger as the only alternative to putting into the nearest port. Perhaps it was that the Nigger was so lazy and Reddy was anxious to get his room!

There were reasons why putting into port and trying to get another second was not to be thought of. There was a cargo waiting the first tramp which would take it at Oyapok, and the "Woolly's" owners were not men who loved to spend coal on a light ship and get no return for it. Captain Holroyd took a chance, and the Nigger went to the engine room.

And so Beck stood in the bows and spat at the gray-green water below, and looked at the reddening afterglow, smothering up in the clouds, and smelt half a gale a-coming, and wondered sleepily about the glass, and decided it was none of his business, and spluttered a little at his disgust of being shipmates with "a rotten, stinking nigger, who doesn't know a stuffing box from a box of sardines," and finally made his way to his bunk, where he turned in all standing.

Meanwhile, Old Ocean was slowly making up its mind that something was going to happen. The afterglow faded into a ruddy smoke, then into a purple matching the east; the clean-cut horizon faded out; the lone star was no more, and an odd little lift under the bows mingled with the slow, stately, mighty swell that up to now had been as regular as a pendulum. Somewhere, off to the south and east, something was brewing. At eight bells it was as dark as pitch. The glass still sank into itself, shrinking from the coming storm. Had there been regular wireless service on the Minnie Woolworth, a regular station and a commercial operator, she would have heard long before of storm warnings set, and of a hurricane coming up the coast; but whoever heard of a set of saving owners installing proper equipment to let a tramp captain have the news? The old second-hand set, bought at a sheriff's auction, and the self-taught Andrews had been plenty good enough; lots better equipment, in fact, than some had.

But the unheard wireless warning was not needed now. Five senses and the glass had shown him what was happening. He did not know when, or how, or exactly where, but even a lubber could have told from the hot feel of the air, and the deadly murkiness of everything, and the twitching, uneasy breathing of the water, and the oily, greasy, slippery way it slapped at the bows, ran hungrily along the rail, and hissed off into the wake . . . something was going to happen.

Down in the engine room the Nigger was fast asleep. He was stretched out on the seat, his head against a feed pipe and his feet straggling along the grating. Unlike his race, he slept lightly, and a single peal at the jingle would have waked him. He knew the captain wasn't coming down, he knew Beck was asleep, and he trusted to luck not to be caught.

"For why I not get um sleep?" he argued with himself. "Hit foolishnuss, dis a-yere stayin' wake when noffin for um ter do. Day ole engines runnin' erlong as smoof as er greased pole—Hellum wid um regulashuns. Didn't ship for no engine-eer nohow!"

But he was caught. And it bears heavily on what happened, and shows that even a black man, of no education, but once removed from savagery, may have that germ of manhood in him which puts others before self, and stands to help the greatest number to their greatest good in spite of personal consequences, whether personal liking be at stake or no. For Beck caught him napping, and kicked him soundly, and cursed him until even the Nigger's ears burned and the whites of his eyes showed, and he cowered away from the dominant white race and the blazing white man's eyes.

"You black hound!" said Beck, not mincing his words. "You spawn of Hades, sleeping on duty, are you? I'll show you how to sleep when I sleep. Here I am taking eight hours to your four, because I can't trust you for five minutes—and you, with eight hours to sleep in, and better grub than you ever

had in your lazy, good-for-nothing life, have got to curl up like a cat and let my engines go to the devil while you rest your precious chalky, nigger eyes! Get out of my engine room, you loafing misbegotten son of—of— Oh, *get out* before I take a spanner to you!"

By all of which it may be seen that Beck was somewhat annoyed. And Beck reported to the captain, *via* the speaking tube; and the mate, at the side of the man at the wheel, and the captain came down two steps at a time, and threatened the Nigger with terrible things, among which irons for days in the hold and no water, and stringing up by the thumbs, were the mildest and the only two printable threats of the lot. For this was a man's ship, and a man's job, and short hands make ugly tempers and hard work, and the thin veneer that towns and owners and papers to sign and a little money to spend smears over a seaman, of none too high a class, slips like a forgotten cloak from his back when the sea is purring threats in his ears, and danger stares over the rail with unwinking eyes, and one man's dereliction of duty may mean the lives of all. This was no time to sleep, and the captain knew it—but he knew, too, the limits of a man's endurance; and should he punish the nigger now there would come a time when Beck could no longer keep his eyes open; when sleeping on duty would be his portion, not with, but against, his will, and then, if danger had leaped the rail and stalked among them, and if the glass had been proved a true prophet . . . then might the just punishment of one man bring death to them all.

So the captain did nothing but lash with his tongue, and that he used less oaths and more big words was no comfort to the Nigger. It is just as much of an insult to call a man something he cannot understand and to mean it, as to call him by the lowest epithets in the language with all of which he is familiar. When the captain's anger had spent itself, and something in the huge frame of the scowling negro, who could so easily have done for them both with one mighty hug of his terrible arms, raised a smile to Holroyd's face, he ended with calling him a "blasted parallelopipedonical pachydermatous anachronism." The Nigger's eyes flashed, and he half raised his fist—then dropped it, racial subserviency too strong for his anger.

It had been like this for the three days he had served. Something was always wrong. He was cussed and kicked, and kicked and cussed for something left undone or something done wrong, all the time. Now it was too much steam, now not enough. Now it was a waste of oil; now it was the engines grinding themselves to splinters with none at all. Now it was a tool out of place; now all the spanners so put away they couldn't be found. And the Nigger grinned and thought little of it part of the time, and sulked and planned revenge the rest of the time. "For why dey raise such um Cain 'bout it? Didn' haf to haf me engine-eer, did dey? Tink dis a-yere nigger jus' lak dirt under um feet! I fix um! Some day sompum goin' happen in dis a-yere engine room! Uh! Huh!"

And something did happen, but it was not the Nigger who made it happen, nor the Nigger's idea of revenge. That it was revenge at all . . . but let the sea work out the story.

At eight bells, midnight, the Nigger woke up, from habit, and was frightened. There was a horrible sinking feeling to the ship as she let down between two hollows and staggered up a slope again, a horrible murky dripping nastiness to the air, a feeling of oppression and closeness about him. The Nigger was frightened. He crept along, holding tight, until he got to the engine room.

"Wha—what's a-gwine happen, Massa Beck?" he said.

"God knows!" said Beck shortly. "Nothing but a gale, I reckon. What you scared at? Want to come in and go to sleep again, you good-for-nothing cur?"

"Ain' gwine sleep no mo', Massa Beck; jest want ter stay an' git wahm!"

"Get warm! Get *warm!* Why, you lying skulker, you're dripping with sweat now! Get warm, indeed! You're scared!" And Beck turned his back.

And then it happened. With a howl as of ten thousand devils in agony, with a screeching, yowling smother of noise

He whirled the wheels and shut off and on the steam to save the lives of the men above

that blotted out speech and clank of engines and chug of pumps as a passing train blots out a baby's lisp, the wind was upon the "Woolly." And ahead of the wind, or with it, or behind it, came a wave—not a swell, not a comber, but a gigantic elevation of water, stirred up mayhap by the hurricane, perhaps by some subterranean volcano . . . but there, anyway. A tidal wave by itself is enough to strike terror to men's souls at any time. A real South Atlantic coast hurricane is enough for a big ship with a full crew to handle and live it out. . . . But both together!

Holroyd saw the wave just a second too late. He rammed his helm hard down and called for all the speed there was in the port engine, and Beck jumped clean over the high-pressure cylinder to get to the throttle. The Nigger fell on his face and dug his bare toes and his hands into the grating, and held on for dear life. But the effort that the Minnie made was not enough. It saved her from utter destruction. At a slant she took the wave and began to climb, but a good part of its force took her on the beam. And it was as if a million tons of weight had been attached to her keel. A million tiny, devilish hands dragged and pulled at her, and a million million drops of water, each falling with its fraction of an ounce of force, pushed her back on her haunches and made her make sternway with both screws going like mad, deep under water. A shriek from the stokehole, barely heard in the din of water told of some poor devil thrown against hot iron. The air was full of water—in the wheelhouse, every glass in splinters on the floor, the water washed the blood of the cut hands and faces away before it fell. Overhead was nothing but flying spume and wind and water; the line of demarcation between sea and air was lost, and the two joined in a smother of hellish white water that seethed and hissed and bubbled and came on board and tore things loose and carried them away. All the boats went . . . the after deckhouse was in splinters and a mile away: there was wreckage everywhere.

Then the starboard rail went, and carried the vangs of the big derrick with it; the boom swung twice from side to side, then tore away, splintered the starboard side of the engine room, snapped the shrouds of the mast like threads, and it, too, went by the board. Now none of these things were vital . . . all could be remedied, and with a mast or without it, the engines should do the trick. Holroyd thought this like a flash and was comforted, even while his hair raised as he sensed, rather than saw, the following wave of the monster that was now beneath him. But Holroyd didn't know that the crash of the boom in the engine room had split the floor grating, and that poor Beck had dropped through it where it broke and opened, and that it closed on him and crushed him as he went through, and that his life went out with a choked-off snarling scream, too quick for the sudden agony to reach full speech.

And in the engineer's shoes stood the Nigger . . . the worthless "spawn of Satan." The Nigger was dazed. Things had happened too quickly for him. There at his feet, his head and shoulders above the grating, his feet and body below, was Beck, the man who had cursed him, dead of a fearful death. The terrific motion of the ship made his head swing back and forth, a horrible sight, and the Nigger could fairly hear him saying "You—spawn of —!—you—spawn of —!" with every sickening roll and nod of the head.

Slowly the blood left his face, his knees shook beneath him, and a nasty pasty pallor replaced the bronze of his clear black skin. The Nigger was terrorized. Sharp across his terror-crazed brain rang the tube bell. Habit was stronger than fear.

"Aye—aye, sir," he called.

"Full speed starboard," came the word.

The Nigger turned slowly, the terror still on him. Then, perhaps it was merely latent manhood, perhaps it was some atavistic memory of great savage ancestors who fought to the last ditch and fought again while they died, who never gave up to any odds, and who looked at death with a laugh, and at torture

with a song . . . perhaps it was merely obedience to the great impulse in all humanity to do the best we can for those whose lives are in our hands.

The Nigger responded. The "spawn of hell" grabbed at the wheels and spun them, and the Minnie began to turn.

Then began a long, long fight. The mast and the boom were over the side and tailed along as a drogue at the wrong end, pulling the vessel around and making her starboard engine work double tides. Men were hacking with axes at the wreckage. . . . It cleared with a jerk. The starboard engine raced at that moment and the port nearly threw her beam to the seas. Those seas might not have done much, but the wind would have torn her to ribbons and put her so deep with Davy Jones that not even her name would remain!

Like a flash the Nigger shut off steam on one and turned on more at the other. He seemed alert and alive and vital. The fear was gone. His color was back, his knees no longer shook.

"Think um sea gwine make us 'fraid, huh?" He talked to himself. "Hellum wid um sea. No ole sea nor win' ever blow gwine mak dese a-yere engines go back on um."

Every two or three minutes one engine would race. The Nigger had to stop it, and stop it quick. "Lose um screw and we all git hellum shore enuf," he whispered. "Would, would yer?" This to the port engine, racing her vitals out. Whirl went the throttle, off went the steam, and a sighing sob from the cylinders told of the fact. Then, the next minute, on went the steam, the cylinder heads pounded wtih the blow, and off went the engine again. Thus for three hours. On, off. On . . . off. . . .

And then the final act, in this scene of death and destruction, the last unpretty touch to an unpretty tale. Strained beyond endurance by the racking, and possibly weakened by the blow of the boom, a joint in the main steam pipe gave way—not utterly, but enough to flood the engine room with steam.

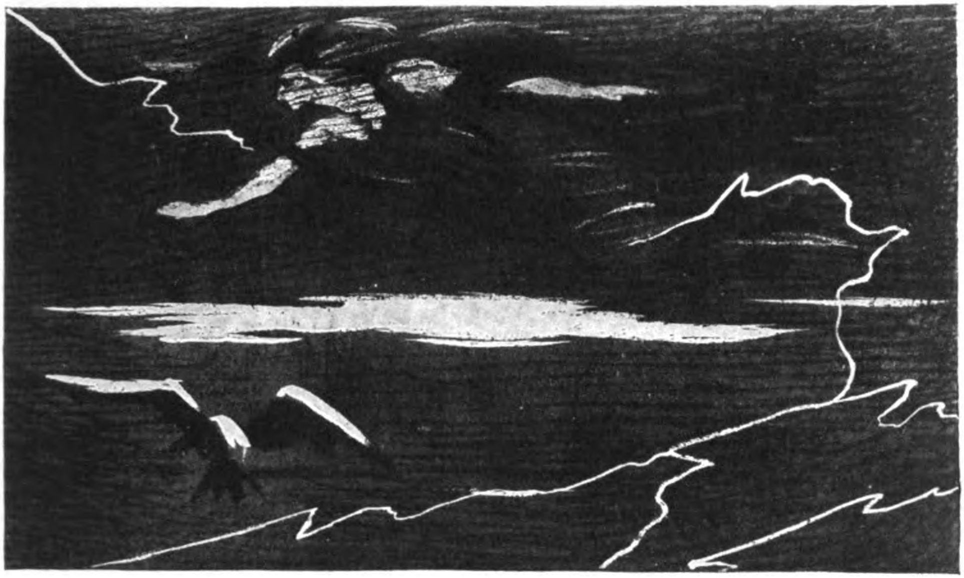
Do you know what that means? It means, if it is bad enough, that the men in the engine room cook to death; the most horribly agonizing death a man can die, and it is a death a man cannot run away from; for while life lasts the engineer must stick to his wheels, that the ship may live.

. . . The steam came not with a rush, but with a whisper, and it filled the room slowly. It got hotter and hotter. And its force just missed the throttle on the port engine. Had an angel passed, he might have heard a Nigger's prayer; he would have heard a Nigger's moan. Had Davy Jones, who seeks a sailor's soul for the watery inferno he inhabits, looked in, he would have slunk ashamed at the sight of a man in the pride of his sleek, great strength, standing alone, and cooking alive, while he whirled the wheels and shut off and on the steam that saved the screws and the lives of the men above. And every time he throttled down, the steam came harder through the break, filling the room, vicious, seething, cruelly killing. . . .

Half an hour later the wind fell as it had come. The captain staggered, rather than walked, to the engine room to see how Beck fared. As he looked into the cloud of steam which came through the open door, the engines gave a shuddering sigh, and stopped. The steam was gone. Without waiting to inquire why, Holroyd had a drag rigged, and hove to on the sea, now getting up mountain high. When he got back to the engine room, the steam was gone. Beck, shriveled, crisped, showed half above the grating.

The black hound, the spawn of Satan, the Nigger, stood upright, his eyeless sockets looking straight at the bell, the ring of which he would never hear. One hand was upon one throttle, one hand upon the other. Holroyd's face was a face of suet as he gazed. Then, as if he had but waited for the captain to see that he had done his duty, the enormous frame tumbled, sank to the floor, and his half-fleshless arms encircled the head of the man who had cursed him for a cur.

"God—God—*God!* said the Captain. . . . "The Nigger!"



THE WIRELESS GHOST

Ghosts there are of the crying winds, and ghosts of the weeping rain,
And ghosts there are of the dead, dear days, which cannot come again!

Warlocks there be, of the witches' tale, which haunt the house of sin,
And spirits restless of their quest for loves of the might-have-been!

But, o'er the heart of helpless earth and the pulse of prostrate sea,
There hangs a Soul of Silentness, who laughs in his dumb, dread glee!

He drives the blind acoustic cloud o'er a sea as still as oil,
He shakes the Dead-Spot vacuum in an airless, deaf turmoil!

He reads unread marconigrams, which reach no mortal ear,
He knows the deadly pocket-hole, where the lost calls disappear!

His is the toll of the foundered ships, that missed the muffled bell—
Toll of the derelicts which drift, unmanned, twixt Heaven and Hell!

O, ghosts there are of the crying winds, and ghosts of the weeping rain,
And ghosts there are of the dead, dear days, which cannot come again!

Warlocks there be, of the witches' tale, which haunt the house of sin,
And spirits restless of their quest for loves of the might-have-been!

But, o'er the heart of helpless earth and the pulse of prostrate sea,
There hangs a Soul of Silentness, who laughs in his dumb, dread glee!

K. D. M. SIMONS, JR.

BISHELL

An Adventure in Wireless*

By Frank Parker Stockbridge

AT one o'clock in the afternoon of Wednesday, December 31, 1902, Samuel S. Chamberlain, managing editor of the New York Morning Journal, called me into his office and handed me a newspaper clipping. It was a three-line item from the morning's paper stating that Guglielmo Marconi, the inventor of wireless telegraphy, would leave Glace Bay, Nova Scotia, on the following Monday for Cape Cod, where he was to establish the first trans-Atlantic wireless station on United States soil.

"Mr. Hearst wants the first wireless message sent from the United States to England to be a message from himself to the editor of the London Times," said Mr. Chamberlain. "Please arrange it."

I knew nothing about wireless except what I had read in the newspapers, and that was principally advertisements. One of the largest advertisers was the American Marconi Company. I called at this office and saw John Bottomley, then general manager.

"We can do nothing to help you," he said. "Nobody but Mr. Marconi himself can be of any service to you in this matter."

At the nearest railroad office I found that if one wish to get to Glace Bay before the hour when it was announced Marconi was to leave he must catch either the 5 o'clock train for Boston or the 7:30 for Montreal that night. I looked at my match—it was 3 o'clock. There was no time for deliberation. I telegraphed to my home in Brooklyn, directing the packing of all my heavy clothes, then called up a relative who was in touch with the electrical affairs.

"Who in New York knows Marconi best?" I asked.

"T. Commerford Martin, editor of the Electrical World," he replied.

"Will you call him up and tell him I am all right?"

"I will," replied my uncle. Then I went back to Mr. Chamberlain's office.

"It will take a lot of money to pull off that stunt for Mr. Hearst," I told him. "I'll have to have it right away, or it won't do any good at all." I explained my plan briefly. Without a word he turned to his desk and wrote an order on the cashier for the money. After converting the order into currency I called Mr. Martin on the telephone.

"I want a letter of introduction to Marconi," I told him. "Come right over and you can have it," he answered.

"Here is the letter," he said, handing it to me as I entered his office. "You will find Marconi a most agreeable and companionable fellow."

"Does he speak English?" I asked timidly.

"As well as you or I," replied Mr. Martin. "He is half Irish, you know. His mother was a Jameson of Dublin, one of the famous family of distillers, and he was educated in England."

There was relief in this information, for the idea of trying to persuade a foreigner who did not have a complete grasp of my only language had been looming up in my mind as one of the difficulties in front of me.

"I'll tell you what I will do," added Mr. Martin. "I will send him a telegram that will pave the way for you, and will have some other friends of his wire him, too."

There was barely time, after I had thanked and left him, to eat a hasty supper, meet the messenger who brought my

* Courtesy Modern Pub. Co.

bag over from Brooklyn and catch the Montreal express.

This was Wednesday, and at midnight on Friday, exactly on schedule time, the train pulled into the station at Sydney, Cape Breton. Glace Bay and Marconi were only fifteen miles away.

The clerk of the Sydney hotel came from behind the desk to show me to my room. As we walked up the stairs I asked if I could not get a room with bath.

"We have only one room with a private bath," replied the clerk, "and that is occupied now by a gentleman who is going out on the 6 o'clock train in the morning. He is a New York man, too, by the way, and perhaps you know him. His name is C———."

"What is his first name?" I demanded.

"I think it is James," he said.

"Please," I begged, "go downstairs and hide the register until after Mr. C——— leaves."

The name was that of the star reporter of a rival New York paper. Only one possible errand could have brought him to Sydney—to get a "story" about Marconi and possibly to do the same thing I had been assigned to do for the Journal. It was not impossible, however, to find out whether he had done any serious damage so far, by the simple process of calling up the two telegraph offices—the Great Northwestern and the Canadian Pacific—and inquiring whether they had carried any "press matter" for New York in the last few days.

"No press stuff filed for New York this week, except bulletins by local correspondents," was the reply from each, and my mind was relieved temporarily. It was certain, then, that C——— had not telegraphed anything about Marconi to his paper, and whatever he had sent by mail could not be used before the Sunday edition. There was still time to "take the edge off" in that event. With this comforting thought I left a call for 6:30 and went to bed.

In the morning C——— had departed according to schedule, without suspecting anything. After breakfast I called up Mr. Marconi on the telephone. "Come right over," he explained as soon as I had identified myself. "I had a splendid telegram from Mr. Martin about you and I have been expecting you. You can get a trolley car at 9 o'clock."

Three-quarters of an hour later we were seated before the log fire in the comfortable living room of the little cottage at Glace Bay which formed the headquarters for the wireless experi-

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menters. I presented my letter of introduction, but he waived it aside. "It is enough that you are a friend of Mr. Martin's," he said. "You can have anything you want if you will only tell me what it is."

"Everything," I replied. "I want to know what you have done here, what you are doing and what you intend to do. When are you going to Cape Cod? Also, how much of an interview did C——— get out of you?"

"He didn't get much," he replied. "Who is he, anyway? He seemed to consider himself a person of some im-

portance and was surprised that I had never heard of him."

It did not take long to discover an intensely human personality in the distinguished young inventor. Much more the Englishman than the Italian in appearance, with his fair hair, blue eyes, pink cheeks and little blonde mustache, his English had not the slightest trace of a foreign accent. He talked freely and enthusiastically about his work, his methods, the success of his trans-Atlantic transmission and plans for the future. He predicted a time when a rate of one cent a word from continent to continent would prevail, and pointed out the lines along which he expected the science to develop.

Then, wrapping himself up in his leather jacket and fur cap, he led the way to the laboratory and operating room. This was a one-story building, set between the four great latticed towers from which the aerial wires were strung.

"Your friend C——— did not get this far," he said as we crossed the windswept bluff and entered the little building. "Better be careful in here," he added, as we threaded our way along the narrow passage. "There are pretty heavy voltages here, and I wouldn't want you to be hurt. Better keep a foot or two away from any of the apparatus, for I have known a spark to jump nearly two feet."

To one who had never seen a wireless installation and knew nothing practically about the science of electricity it was a noteworthy introduction to have Marconi himself serve as master of ceremonies, explaining with painstaking simplicity the uses of all the apparatus.

"Let's see if we can raise Cornwall," he said, stepping to the huge sending key, a lever of wood fully three feet long. "Better put your fingers in your ears," he added, as he pressed the key. The advice was good, for the noise was deafening. I can liken it to nothing but a machine gun being fired so rapidly that the sound is almost continuous. Huge sparks jumped from the knobs of the immense Leyden jars that filled the center of the room, and illuminated the place like flashes of lightning. "Crash! Crash! Crash!" Four or five times Marconi repeated the signal, three short, sharp, staccato "dots"—the letter "S" in the Morse code.

The silence was tomblike as the noise stopped. Marconi turned from the sending key and picked up a telephone-like receiver, mounted on a headpiece.

"You may watch the tape while I listen for an answer," he said, indicating the receiver tape, similar to that used in the earliest telegraph installation on land. Marconi stood, patiently, with both ears covered by the receivers.

"There they are!" he cried a few minutes later, smiling joyously, and the tape confirmed his statement. The needle pressed upon it for an instant, lifted, pressed again, once more lifted and again impressed a dot. Then a pause, then a dash, then another dot.

"- - - —-." "SN," it read, the telegrapher's code for "I understand."

"The wireless works very much better at night than by day. This is the first really clear signal we have had from the other side in the daytime," said Marconi, tearing off the strip of tape and handing it to me. "You may like to keep this for a souvenir."

As we left the laboratory the inventor led the way down to the bluff that gives the name of "Table Head" to this outlying corner of North America. As we stood on the very brink of the precipice, facing eastward, 1,700 unobstructed miles of ocean lay between us and the coast of Ireland. The smoke of a steamer, hull-down below the horizon, was the only thing visible except the tossing waters.

"Freighter, probably, sailing the great circle route to a British port," was Marconi's comment. "It was not much beyond where she is now that La Bourgogne sank, with the loss of almost all her passengers, less than five years ago. Had she been equipped with wireless telegraph apparatus she could have summoned aid from Sydney, from Newfoundland or from other ships that were close to the Grand Banks at the time. The day will come," he continued, his eyes glistening, "when every ship will carry wireless, when every port will have its wireless station. When that day comes

there will be no more such catastrophes as the wreck of La Bourgogne. If my invention never accomplishes anything else than to save the pasengers and crew of one ship it will amply pay me for all the money I have spent on it."

His words came back to me with renewed force a bare seven years later, when the passengers and crew of the Republic were saved only because their vessel was equipped with wireless. As I read the newspaper account of that rescue I knew how Marconi must have felt when he learned of it.

After making a few hurried snapshots I caught the next trolley back to Sydney, promising to call on the inventor again on Monday, for he had told me that the newspaper dispatch was incorrect and that, instead of leaving on Monday, it would probably be a week or ten days before he was ready to start for Cape Cod. An hour later a 1,200-mile telegraph wire was connecting Sydney direct with the office of the Morning Journal and, with the aid of a typewriter borrowed from the local newspaper office, 5,000-word interview with Marconi was "filed" in the New York office in ample time for the Sunday edition. Then I went to bed and slept the clock around. The following Wednesday the New York Sunday papers reached Sydney. Marconi was as pleased as a boy to see that interview displayed under big headlines on the first and second pages, while C——'s "story" was buried on the inside of the "editorial section" of his paper.

During ten pleasant days spent at Sydney, visiting Glace Bay nearly every day, no word was said about the real object of my visit. The psychological moment had not arrived. One night there came a telephone call from Marconi. "I am ready to start now," he said. "I am going out on the early train tomorrow morning." I joined him at Sydney, first sending this telegram to my paper:

"Wire me at Truro, Nova Scotia, on board southbound train, the following message, without addition or comment." Then followed the message I wanted to receive there. Sure enough, at Truro a messenger brought me a dispatch. "No bad news, I hope," said Marconi. "Not at all," I replied, handing him the telegram. It read this way: "Would it be possible to arrange with Marconi to let first trans-Atlantic message from Cape Cod station to England be a message of congratulation from William R. Hearst to editor London Times." The inventor read the message twice. Then, while I held my breath, he handed it back to me, smiling.

"It might be arranged," he said, and I found myself breathing freely again. "Of course, if President Roosevelt should want to send a message to the King of England it would have to go ahead of everything else. But I have no such desire and shall not suggest it. Mr. Hearst's message can certainly be second, and probably the first. Your paper has treated me very nicely."

On the last stage of the journey to Cape Cod we were accompanied by several Boston newspaper men, who were very curious to learn my status with the party. Finally they concluded I was the inventor's secretary, and Marconi did not disabuse their minds of this impression.

When we arrived at the Marconi towers at South Wellfleet the impression was heightened by Marconi's apologetic manner in informing me that, because of the unexpected presence of one of the engineers of the American Marconi Company, he would not be able to put me up at the cottage, but that I would have to go to the hotel at Wellfleet, where the Boston men were also to stop. It was difficult to maintain the role, but I made daily trips to "The Towers" and always brought back some news for the Boston reporters, which they accepted as official, coming, as it did, from "Marconi's secretary."

The problem of getting news to New York from Wellfleet was a difficult one. There was but one telegraph wire on Cape Cod, the railroad wire, and the operator at Wellfleet was also the station master, freight agent and general man of all work. He could send a ten-word commercial message without going to pieces, but when some of the Boston newspaper men tried him out on press dispatches he threw up his hands. It happened, however, that one of their number—Jack Taylor, of the Boston

Globe—had been for years a press operator before he became a reporter, so he volunteered to handle the key for all the others, provided they all gave him a chance to get his "story" in first, which was a very satisfactory arrangement all around.

It would have been possible to go to South Wellfleet and take a chance on the operator there, but there would have been the constant risk that Taylor might be in the Wellfleet office hearing any dispatches sent from there. The telephone was the only recourse. The only public telephone in the village was in the booth in the postoffice. The booth was far from sound-proof, but the postmaster kindly gave me a duplicate key to the postoffice, so I could use it at night, when there was no one around to listen.

All attempts to talk to New York by telephone from Cape Cod proved unsuccessful. I spent hours in the postoffice the first night, trying to make my office understand me, but it was hopeless. I could talk with Boston very well, however, so it was arranged with the manager of the Postal Telegraph Company in that city that I could dictate my dispatches to an operator, who would at once send them by telegraph to New York. By this plan we figured the loss of time would not be more than a minute or two.

There was a wait of a week or more at Wellfleet for Marconi to get the apparatus adjusted to trans-Atlantic work. Every night I would slip away from the newspaper men in the hotel, go around the corner to the postoffice, lock myself in and in the dark—for I did not dare to show a light—telephone a news "story" to the telegraph office in Boston, receiving at the same time any messages my offices had sent for me.

One evening, after supper, Marconi telephoned: "Can you come over right away?"

It was a particularly dark night and the wind was blowing across the Cape at about 40 miles an hour. The four-mile drive to "The Towers" seemed ten.

"We shall get it across tonight," said Marconi as I entered. "The instruments are very well adjusted and we got a signal across to the other side a little while ago. We have been receiving their signals for two or three days. I think that some time between now and midnight I shall be able to get that message out for you. What do you want to say in it?"

I saw no reason to preserve my incognito any longer, and told them

It did not take us long to draft a dispatch addressed to the editor of the London Times congratulating him and the English people on this new bond of communication between the two great English-speaking nations, and signed "William R. Hearst."

To have waited at "The Towers" until the dispatch was sent would have meant the loss of valuable time, so it was arranged that I should be in the postoffice all the rest of the evening, where Marconi promised to call me up as soon as he had the news I was waiting for.

The curiosity of the Boston newspaper men when I got back to Wellfleet was satisfied by the news that signals from the other side had been received, which news they promptly wired to their papers. While they were sending their dispatches from the railroad station I was getting telephone connection with my Boston operator. I sent a "bulletin" to the Journal, advising that the wireless message would probably be sent soon. Then I sat down and waited in the dark, not daring to smoke. It seemed like hours before the telephone bell rang—just the faintest little tinkle. Marconi

himself was on the wire, so jubilant and excited he could hardly speak.

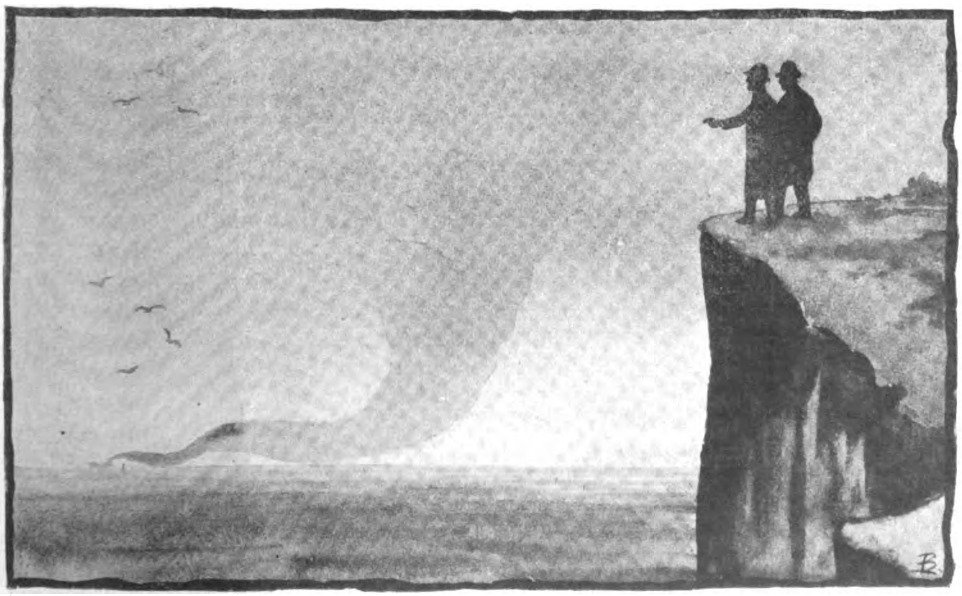
"I have just got your message across," he said. "We got perfect communication about an hour ago. Mr. Bottomley sent me a wire tonight, saying that the President wanted to send a message to King Edward. We sent that and Mr. Hearst's message and got a return signal that they had been received. Mr. Hearst's message was sent the longest distance a wireless message has even been transmitted, for the President's message was picked up by our station at Cape Race and relayed from there, while Mr. Hearst's went directly across the ocean."

It seemed an interminable time after I had hung up the receiver before "central" responded again and gave me the connection with Boston. At last I got the operator in the Boston telegraph office and was just about to ring off after dictating my dispatch, when he said: "Wait a minute. Here is a message for you, coming from New York. I'll read it to you. It says: 'Good work. We received cable acknowledgement from London Times before we got your message.'"

An even more interesting sequel came the next day, when the Boston reporters began to get telegrams from their papers, asking how it happened they had let the New York Journal pull off a trick like this under their very noses. They came to me to find out whether it was true, and if so, how it was done. I saw no reason to preserve my "incognito" any longer, and told them. They were "sore," of course, over having been "scooped," but they were all good fellows and recognized the fact that any one of them would have done the same thing had he had the chance, so there was really no hard feeling about it.

A year or so later I was introduced one day to the managing editor of the paper with which C—— was connected. "You're the fellow who got that Marconi story, aren't you?" he asked. I admitted it. "Well," he said, "if it isn't violating the confidence of your office I would be very much obliged if you would tell me how on earth your paper ever found out that C——had gone up to Glace Bay in time to send you after him." I kept my face as straight as I could and replied gravely that to give him that information *would* be violating an office confidence.

I have never had an opportunity to meet Mr. Marconi since, for every time he has been in this country I have been in the West. I shall meet him again some day, I hope, and when I do I intend to tell him what he may not yet know—that the only reason I went up to Glace Bay was to get that one dispatch sent for Mr. Hearst.



IN THE SERVICE

SHORE-TO-SHIP DIVISION

To have visited practically every seaport on the North and South American coast from Boston, Mass., to Buenos Aires, Argentina, is no mean mark of distinction in itself. And to have travelled over this space as a wireless operator with his eyes on the scene before him and the news of the world hundreds of miles away buzzing in his ears by means of the radio apparatus makes the experience doubly interesting. So it doubtless proved to Robert Irving Young, manager of the Marconi station in Tampa, Fla., during the five years that he spent in the wireless cabins of various craft engaged in the coastwise, West Indian and South American trade.

The early history of Young begins in Bridgeton, N. J., where he was born twenty-five years ago. His initial work in telegraphy was done on the Philadelphia & Reading Railroad. After devoting two years to this employment he resigned in order to begin the study of wireless. He was not able, however, to give his full attention to acquiring knowledge of the art, for he was earning his living by working a "split" trick for the Postal Telegraph-Cable Company—that is he was employed for a few hours in the morning and about the same length of time at night, enabling him to have his afternoons free for the study of wireless at the station at the Bellevue-Stratford Hotel in Philadelphia. This station communicated with a station at the Waldorf-Astoria in New York City.

Having qualified for duty as a wireless man, the early part of 1909 found him located in the field of practical radio telegraphy—a field in which he has been continuously engaged since. His assignments include service on vessels of the Merchants and Miners Transportation Company, the craft plying between Philadelphia and Wilmington, the Creole of the Southern Pacific Line, the Saratoga, of the Ward Line and a detail in the offices of the Marconi Company in the Woolworth Building, New York City.

Young has been detailed at the Tampa station since May, 1913. One of the events in his daily work worthy of mention occurred about a year ago, when a steamship in the Pacific Ocean, 2,000 miles south of San Francisco, lost her propeller during a destructive storm. The operator on the vessel forwarded a message to the owners through the Tampa station in less than an hour after the accident, giving full details of the mishap and assuring the steamship company that a United States cruiser was proceeding to the assistance of the hapless craft and would tow her to the nearest port.

The station over which he exercises control is located on the coast about ten minutes' ride from Tampa by trolley car. Surrounded by palm trees, it is on the edge of the water, the tide on some occasions sweeping up to the very doors of the station.

Tampa is a station of not a little importance in the Marconi chain of shore-to-ship links and Young's duties in consequence are manifold. He has been called upon frequently to flash messages far out on the Gulf of Mexico, his success in this feat of transmission having given him a name for establishing long distance communication.

Marconi Defended As Inventor of Wireless

Under the heading, "Don't Take Away from Marconi the Glory of His Wonderful Invention," L'Italia, an Italian newspaper, of San Francisco, recently published an article of more than two columns in length upholding his fame as the inventor of wireless telegraphy. The defense was inspired by the publication in a San Francisco newspaper of a statement attributed to Professor Edgar Lucien Larkin, director of the Lowe Observatory in Southern California, to the effect that "Wireless telegraphy was not invented by any one investigator: many helped." This statement was made in response to an inquiry by one Giovanni Multini. L'Italia said that Professor Larkin gave a brief history of wireless telegraphy, going back as far as the year 600 B. C., mentioning the scientists who have had something to do with electricity, up to those who dealt with electrical waves . . . giving credit to Marconi merely for being the perfecter of a system of wireless telegraphy.

The article, published by L'Italia is in part as follows:

"Professor Larkin is right when he states that many helped in the discovery of wireless telegraphy, but to this phrase he should have added, nevertheless, that the real inventor of wireless telegraphy was Guglielmo Marconi. The greatest inventions and discoveries of men have all been preceded by various tentatives of other savants, often of different nationalities; but there is always one out of this many who alone is inspired by a spark of genius which makes the discovery or invention an accomplished feat benefiting humanity.

"Such was the case of Marconi. Probably he could not have reached his goal without the studies of those immortal predecessors mentioned by Professor Larkin, but after having given due merit to them, let us not hesitate in admitting that Marconi was the inventor of wireless telegraphy. The world acknowledges him as such and the world is right. Nobody had ever heard of such a wonderful thing as wireless telegraphy before Marconi gave the astonishing announcement that he had succeeded in transmitting wireless messages for a short distance in his native city of Bologna. He did so, not availing himself simply of the studies of other scientists, but by his genius.

"In further support of our statement that Marconi was the exclusive inventor of wireless telegraphy we have but to recur to the late decisions in favor of the Marconi wireless telegraph patents in actions against the De Forest Wireless Telegraph Company and others. The British courts and the High Court of France also decided in favor of the Marconi patents against other claimants.

"How can anybody, after the foregoing, still hesitate in affirming that Marconi was the inventor of wireless telegraphy? It was principally due to his detector and antenna that Marconi laid the foundation of wireless telegraphy which immediately became the great wonder of the modern age. And Marconi, and no one else, was not only the father of this discovery, but also the perfecter and, allow us to say, the nurse who through an endless series of painstaking experiments, brought the marvelous discovery from its infancy to its glorious achievement of to-day when it makes the air speak across land and sea.

"What Marconi has done is known to all: Over 3,000 men-of-war and merchant ships are now equipped with his system of wireless telegraphy by which many thousands of people have been saved from inevitable death through sea disasters. Throughout the world Marconi stations are now to be found everywhere, and through them the air and ether surrounding the earth are daily and nightly pervaded with electrical waves which carry clearly and correctly, the messages of the people of all countries. Professor Larkin cannot deny all this and cannot deprive our good countryman Giovanni Multini, of the satisfaction that it was his great compatriot, Marconi, who really invented or discovered wireless telegraphy."

It has been announced in a dispatch from Rome that King Victor Emanuel of Italy signed a decree on December 31, appointing Guglielmo Marconi a member of the Italian Senate.

How to Conduct a Radio Club

By E. E. Bucher

Article XI.

THE junior radio experimenter sooner or later becomes possessed with the desire to own a piece of apparatus which is to a certain degree not understood and which, outside of the practical radio field, is not known by a particular name. A new word has been coined to designate this device, which is known among practical wireless men as a "variometer."

Some amateurs are of the opinion that the "variometer" is some form of the rotary receiving tuner. Others are not certain what it is, but believe it to be of little value in their work. No distinct definition for the "variometer" has so far been advanced. The principle on which it works, however, is well understood in the electrical field.

The "variometer" may be defined briefly as follows: It is a device for the production of a variable value of inductance without the use of multiple point switches or sliding contacts. It consists of two coils having a fixed value of inductance, connected in series with each other and so mounted that the mutual inductance between them may be progressively varied from a nearly zero value to a maximum value. That is to say, the coils may be placed in magnetic opposition or in magnetic attraction.

The action of the "variometer" will be better understood after looking at Figure 1. Here the coil, AB, is wound in the opposite direction to the coil, CD. The latter coil telescopes into the coil, AB, and for "variometer" requirements should be mounted so that it can be pulled in or out of AB to any desired distance. The coils, AB and CD, are connected in series as shown.

If current from a battery is supplied to the two coils, as in Figure 1, then the magnetic lines of force produced by each coil will take the path as shown. It is at once evident that these lines of force are in opposition. Hence if the coil, CD, is placed entirely inside of the coil, AB, the resultant magnetic field is of nearly zero value and the self-induction of the unit as a whole is practically nil.

Furthermore, it is plain that if the coil, CD, is drawn out of the coil, AB, the magnetic opposition decreases and the self-induction of the unit as a whole becomes of gradually increasing value. It is clear, also that if alternating current is supplied to the two coils, the actions are similar to those just described except that the polarity of the magnetic flux from the coils reverses with each reversal of current. Thus a variable inductance element is produced which allows extremely close variations to be obtained. Further consideration of Figure 1 will reveal that if the B end of the coil, AB, is connected to the D end of the coil, CD, (in place of the connection shown) the magnetic fields are no longer in opposition, but flow in the same direction. Hence, if the coil, CD, is gradually moved into AB then the total mutual inductance value is progressively increased, the maximum being attained when the coils coincide.

"Variometers" need not necessarily take the form shown in Figure 1, but may be constructed after the general design shown in Figure 2. Here the winding, AB, is in circular form; inside of it is placed the winding, CD. The coil, CD, may be rotated on the axis as shown. When the planes of the two coils coincide in one position, the coils are in opposition; but when the coil, CD, is turned completely around, the self-inductance of the two coils is additive.

Again, the "variometer" may be of the type shown in Figure 3. Here the coil is wound in the form of a flat spiral, likewise coil CD. The latter coil moves on the pivot L, through the arc as shown, and when CD is directly opposite AB the inductance value of the unit is at a minimum. This value may be altered by mov-

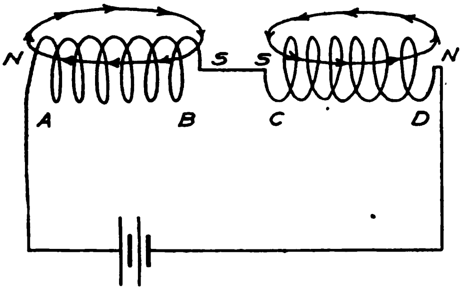


FIG. 1.

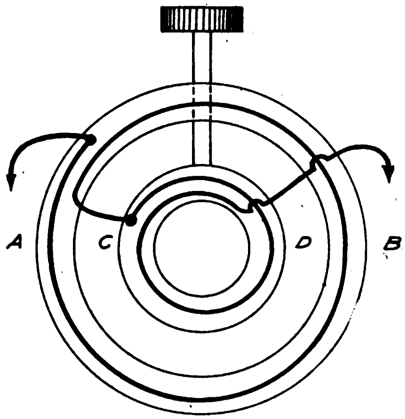


FIG. 2.

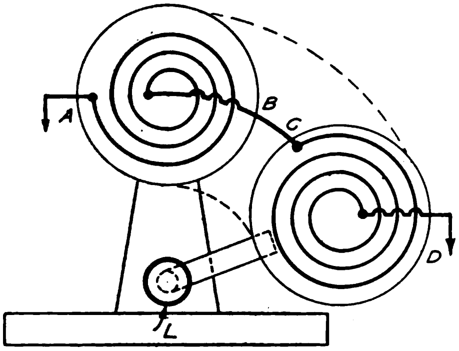


FIG. 3.

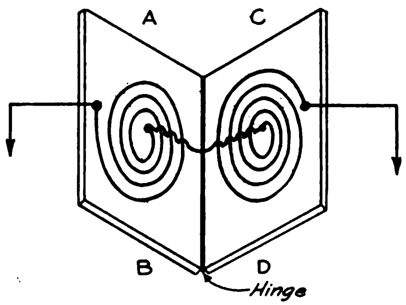


FIG. 4.

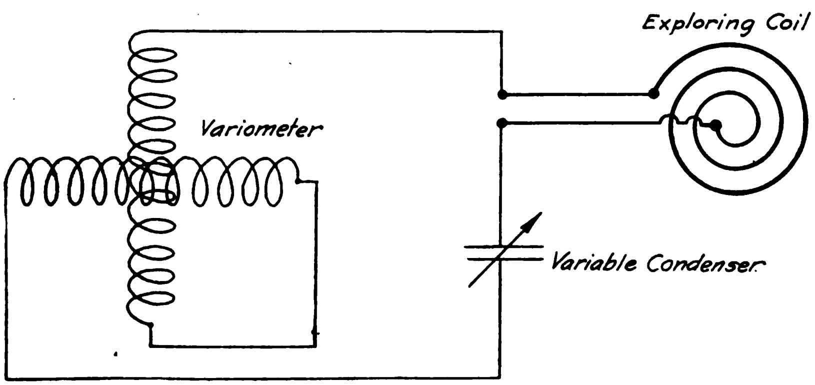


FIG. 5.

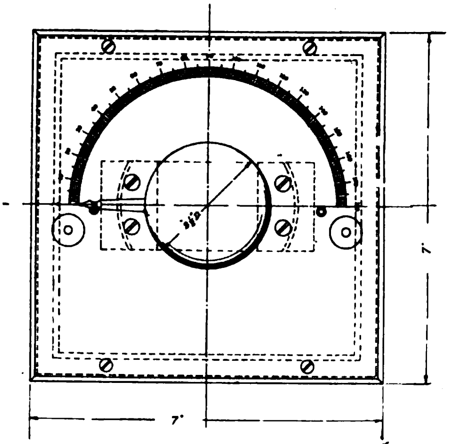


Fig. 6

ing the coil, CD, away from the coil, AB.

"Variometers" are occasionally constructed on the hinge principle, as per Figure 4. In this case the degree of coupling between the coils, AB and CD, is varied as desired by swinging the coil CD, on the hinge. In radio telegraphic circuits "variometers" are of use when extremely fine variations of the inductance value are required. They are often employed in the open oscillatory circuit

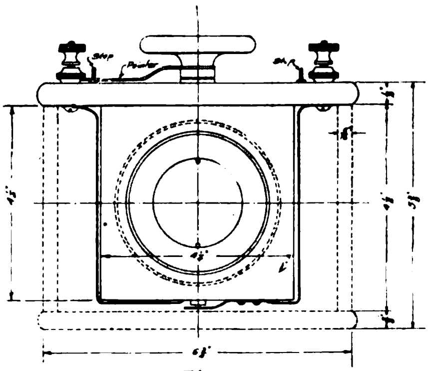


Fig. 7

of the transmitter, particularly when a spark discharger of the quenched type is included in the condenser circuit. They are occasionally inserted in the closed oscillatory circuit for variations of the inductance values and are sometimes used as the coupling element for transferring energy from the spark gap circuit to the aerial wire.

The "variometer" is again useful in the antenna circuit of a receiving tuner, particularly in the type employing multiple point switches on the primary winding or on the loading coil which do not give close enough adjustments of the inductance value. It allows intermediate values of inductance to be obtained between the "taps" which in some cases is extremely desirable.

The "variometer" is also often employed as the variable element of the wave-meter, being connected in shunt to a condenser or several condenser units of fixed value. If used for this purpose a small coil known as the exploring coil is connected in series for purposes of coupling the wave-meter to the circuit under measurement. This arrangement of the circuit is shown in Figure 5. To

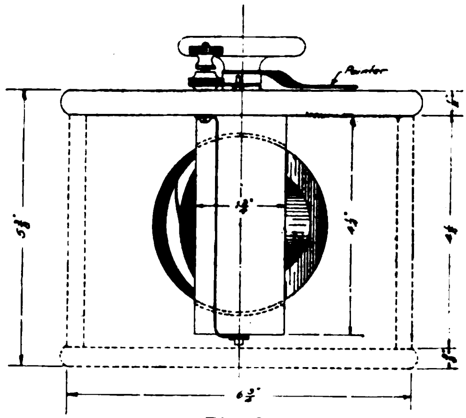


Fig. 8

those familiar with the wave-meter it will be readily understood how the wave-length of the meter is varied as the coil of the "variometer" is turned on its axis. There is an objection to the use of the "variometer" in a wireless telegraph circuit in that it is productive of energy losses when any other but the maximum value of inductance is employed. A little time devoted to careful consideration of the device will show that when the coils are placed in opposition the energy flowing through them encounters the D.C. ohmic resistance of the entire coil. It may, therefore, in some instances be more desirable to use a single coil of the proper value of inductance rather than the "variometer." The resistance losses will be less, to say the least.

The design for a "variometer" as shown in Figures 1 and 2, may be em-

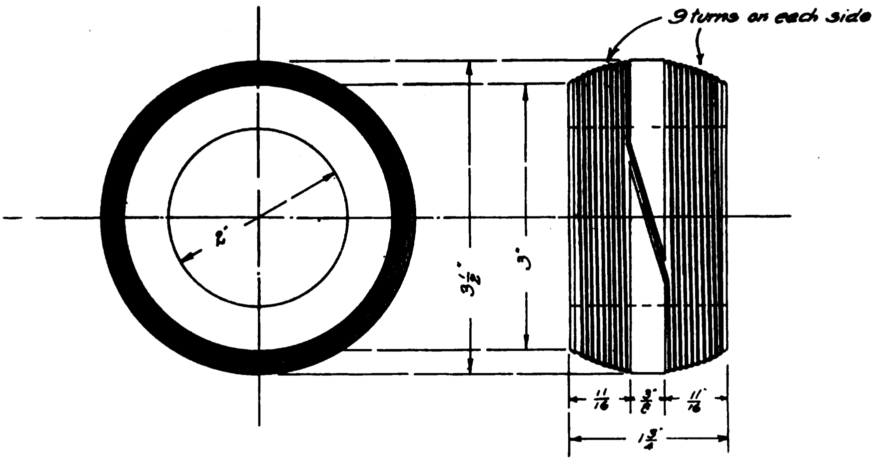


Fig. 9

ployed in the receiving apparatus of a wireless telegraph set, while the types indicated in Figures 3 and 4 are often used in connection with the transmitting apparatus.

Amateur wireless stations located in the vicinity or within the range of stations using undamped energy require a variable element giving extremely fine values of inductance in the antenna circuit. For this reason the construction of two different sizes of "variometers" will be briefly described.

Many amateurs who are somewhat familiar with the "variometer" are under misapprehension as to the maximum and minimum values of inductance to be expected. Some believe that it will take the place of a loading coil, which is quite incorrect. A "variometer" designed after the general idea in Figure 2 will not give a large range of inductance values, but is intended to be employed as a variable element to give the necessary fine adjustment between the "tap-offs" of a loading coil.

The first "variometer" to be described is suitable for the variable element of the wave-meter, while the second "variometer" is intended to be used in the antenna circuit of a receiving set when receiving from stations employing the longer wave-lengths. A top view of the first "variometer" is shown in Figure 6 which is drawn to scale and gives the general over-all dimensions of the lid, the knob for turning the inside coil, the binding posts for connection, and the placing of the 180-degree scale. A front elevation is shown in Figure 2 with the relative dimensions of the inside and outside windings. It will be observed that the inside winding (ball winding) is supported by a brass rod which at the bottom rests on a brush for making contact with one terminal of the ball winding. Another brass rod extends through the top of the coil into the hard rubber knob on the top. This rod is connected to the second terminal of the ball winding, and the final connection from this rod to the binding post is made by a brush underneath the lid (not shown).

The ball for the inside winding and the support for the outside winding are turned from a piece of hard maple on a wood-turning lathe. The support for the outside winding is gouged so as to allow the ball to move freely.

A side elevation of the "variometer" is shown in Figure 8 where the ball winding is partially turned on its axis. A detail of the ball itself is given in Figure 9, showing the general dimensions and the placing of the windings.

While it may not be clear from the drawings, it should be thoroughly understood that the ball for the movable winding has a flange on both edge so that when put in place the winding is at a level with the top of the flange. The same statement applies to the inside winding which is gouged out for the same reason.

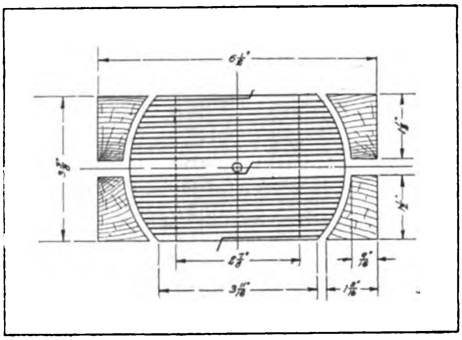


Fig. 10

There are two windings on the ball as shown, consisting of nine complete turns of No. 18 D. C. C. annunciator wire. The stationary winding is also split into two sections so placed that they are directly opposite the movable winding (in the 0 and 180-degree position). The stationary winding is also made of No. 18 D. C. C. annunciator wire.

It may be of interest to experimenters to know how this inside winding is put into place. This is accomplished in a very simple manner by turning out a

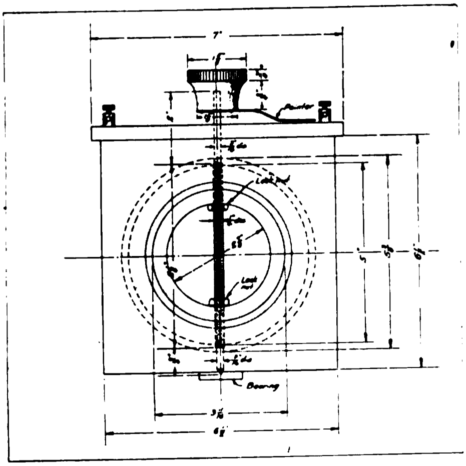


Fig. 11

wooden ball split in the center which just fits inside the stationary winding. This ball is split so it can be wedged. The stationary windings are then wound on the ball; the inside of the stationary support is then covered with two or three coats of shellac. Before this shellac dries the winding on the ball is slid into place and is firmly pressed against the sides of the stationary support by means of a wedge driven into the split of the ball. These wedges are allowed to remain in place until the shellac is thoroughly dry, when they may be removed. It will then be found that the stationary winding is firmly in place and it may be given a coat of shellac on the outside to further insure against the possibility of the wire coming loose.

One terminal of the stationary winding is connected directly to a binding post mounted on the top of the box. The

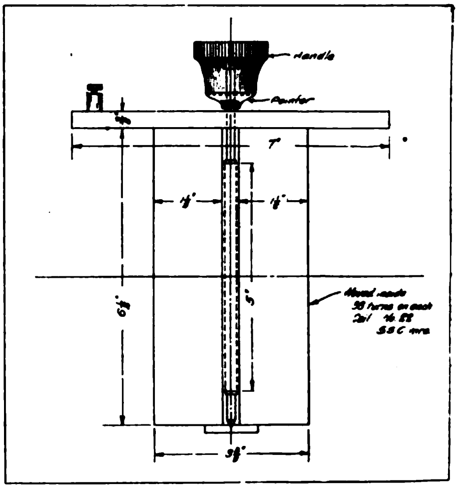


Fig. 12

other terminal of the stationary winding is connected to a brush which is in contact with the rod supporting the hard rubber knob. Connection is made from this rod to one terminal of the ball winding, the second terminal of the ball winding being connected to the second binding post by means of the brush at the bottom, as shown in the sketch.

The "variometer" as described, when connected in shunt to a variable condenser having a capacity value of .001 microfarads gave, in the 180 degree position, a wave-length value of 675 meters, and in the 10-degree position a wave-length of 180 meters. The amateur constructing a "variometer" of this type who also has available a fixed condenser of .001 microfarads capacity will have a wave-meter just suited to his requirements. When connected in shunt to a

condenser having a capacity of .0005 microfarads, in the 180-degree position, it gave a wave-length adjustment of 460 meters, and in the 20-degree position a wave-length of 145 meters.

It may be of interest to know what effect this "variometer" will have on a circuit which already has been adjusted to a definite wave-length. It was connected in series with a circuit having a wave-length of 600 meters and afforded a maximum value of wave-length of 860 meters and a minimum of 630 meters. When connected in series with a circuit already adjusted to 300 meters it gave a maximum of 435 meters and a minimum value of 315 meters. As stated before, this "variometer" is suitable for the variable element of a wave-meter and it is not quite as efficacious for the variable element in an antenna circuit as the second "variometer" about to be described.

It is important that the inside and outside windings move closely to each other in order to secure the greatest possible maximum and minimum values of inductance. A "variometer" suitable for use in the antenna circuit of a receiving set when receiving from stations using the longer wave-lengths is shown in Figures 10, 11 and 12.

Figure 10 is a plan view looking down from the top, giving the dimensions of the ball and the support for the outside winding. Both the support and the ball are made of hard wood and, of course, must be turned out on a wood-turning lathe.

The ball for the inside winding, at its greatest diameter, measures 5 inches, gradually tapering to 3 11/16 inches at both edges. While the ball is shown as being hollow, it may, if desired, be made of solid wood. The ball has two windings which are separated to allow the brass rod to pass through. It is wound full to the edge with the No. 22 S. S. C. wire. To facilitate the placing of the stationary winding, the support is split into two sections which also has the effect of giving the inside windings and the outside windings similar dimensions, and therefore nearly similar inductance values.

The supports for the stationary winding are turned from a solid, square piece of wood and of course must be gouged out on a wood-turning lathe. The two halves of this frame may be fastened together by the top and base of the box or strapped together by a brass strip as desired. The outside winding also consists of a number of turns of No. 22 S. S. C. wire. The stationary winding support and the ball should have a slight flange (not shown) to assist in holding the windings in place.

The inside coil is held in place by a brass rod 8 inches in length, tapered at the bottom where it rests on the brass bearing, B. This bearing may be made to suit the builder. The rod has a diameter of 3/16 of an inch from the end in the hard rubber knob to a distance of 2 inches; for the next 5⅛ inches it has a diameter of ¼ of an inch and is threaded as shown; for the remaining ¾ or ⅞ of an inch, it has a diameter of 3/16 of an inch, and is tapered at the extreme end. The nuts, N and N-1, hold the ball for the inside winding in place.

The windings for the outside coil are put in place by the same method as described in connection with the "variometer" previously referred to, the wood first being shellaced and the windings then pressed into place. A 180-degree scale may be fastened to the lid and pins placed in the latter to limit the movement of the ball winding. A hard rubber or wooden knob having the general dimensions shown may be affixed to the rod. Refinements such as the complete case, the binding posts, scale, etc., may be constructed to suit the builder. Flexible leads should connect the inside winding with the outside winding.

When the "variometer" just described is connected in series with an antenna circuit already adjusted to a wave-length of about 7,000 or 8,000 meters it will alter this value about 450 or 400 meters.

If the amateur experimenter employs the first described "variometer" in connection with a wave-meter, he should use the connections shown in Figure 5. The exploring coil may consist of three turns of No. 18 D. C. C. annunciator wire wound on a form 4 inches in diameter. The connecting leads to this coil may be 2 feet in length.

(To be continued)

From and For those who help themselves

Experimenters' Experiences.

The Editor of this department will give preferential attention to contributions from amateurs covering the design of transmitting sets, wave-meters, etc. There is an over-supply of material on receiving tuners, particularly "loose-couplers," the designs for the majority ofwhich present nothing new or original.

FIRST PRIZE, TEN DOLLARS

An Improved Receiving Transformer

This is a description of a receiving transformer that is very easy to operate and gives first-class results. It will be rather inconvenient for the amateur who has not a lathe to make one of similar design, because of the difficulties of turning out the knobs, etc. The majority of the work can be done on a lathe in a wood-working shop.

The construction is as follows: First, cut the base out of hard wood; it should have dimensions of 18½ inches by 5⅝ inches by ⅞ inch. Next make the coil heads A and A-1 ½ inch in thickness and 6 inches in diameter. Cut out the center of the coil head A-1 so that the opening will have a diameter of not less than 4⅝ inches. Then cut a groove about ⅛ of an inch in width and 3/16 of an inch in depth in one side of each of the coil heads so that the outside edge of the groove will have a diameter of 5 inches. These grooves are for the purpose of holding the tube for the primary winding in place.

Now secure a cardboard tube 6⅞ inches in length by 5 inches in diameter (outside) and wind it with No. 22 enamelled wire, beginning ⅜ of an inch from one end of the tube and stopping the same distance from the other end. I advise the use of enamelled wire because more can be wound on the same space. It is also easier to make a path for the slider and finally it gives a much better appearance than the ordinary silk or cotton covered wire.

After this tube is wound place it in the grooves in the coil heads and then fasten the heads to the base by countersinking them about 3/16 of an inch.

Next get two pieces of hard wood, ½ inch by ½ inch, (B and B-1) 7½ inches in length which are to be used as supports for the sliders. These should be fastened on the coil heads as shown in the drawing. The necessary dimensions for construction will be found in the drawing.

C and C-1 are bearing blocks for the slider rod, D; the knob, E, must fit loosely on the rod, D, so that there is no danger of both sliders turning at once. A piece of No. 8 copper wire, G, serves to conduct the current to the binding post, H. This wire must rub on the slider arm, F. A piece of springy brass, will serve the same purpose as G. The rod D, has a square end on which is fastened the knob, I, to hold the arm, F-1, in place. The primary coil is now complete and we are ready to construct the secondary winding.

Make the coil heads, K and K-1, K being placed entirely inside the tube and K-1 having a flange projecting over the

outside of the tube as shown. Make another tube for the secondary winding, 4½ inches in diameter (outside) and about 7 inches in length, winding it with No.28 enamelled wire, taking off taps as indicated. The number of taps to be used will depend on the number of contacts that can be placed on the coil head, K-1. Bore a ¾ inch hole in the coil head, K-1, in which is to be placed the slider mechanism, U, also shown in Figure 3. Bore a ¼ inch hole in K for the rod O. The brass rod O which is ¼ inch in diameter and 17½ inches in length is supported by the piece, "S" and the coil head, A. Another view of the support T is shown in Figure 5.

The slider arm, N, has a square hole in the end that fits on the square part of U which in turn is fastened to the knob L. A small rod, Q, is fastened between the coil head, A-1, and S. The brass strip, R, rubs on this and keeps the coil from turning.

One end of the secondary winding is connected to the brush, R, which rubs on the rod, Q, Q in turn being connected to one of the binding posts. The other connection is from the arm, N, to the brush, M, which rubs on the rod O, O being connected to the other binding post.

A tuner of this construction has been found very satisfactory indeed in operation and gives a neat appearance. It gives a range in wave-length up to and somewhat beyond 2,000 meters.

EDWARD C. SCHURCH, *Montana.*

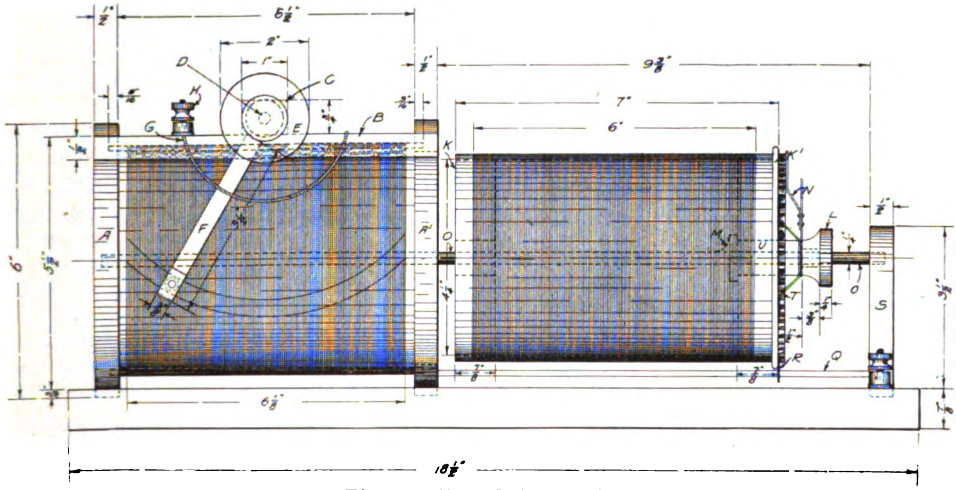


Fig. 1, First Prize Article

SECOND PRIZE, FIVE DOLLARS

An Amateur's Hot Wire Ammeter

The hot-wire ammeter has become a necessary part of the amateur's equipment, but the selling price of this instrument is generally prohibitive to the amateur's pocketbook. I have written a description of an ammeter suitable for the experimenter's use, which is simple of construction and costs practically nothing, as the parts may be found around the average amateur's station. A general idea of the construction of my design is given in Figure 1. The case is made of ¼ inch mahogany, well shellaced both inside and outside. The top and bottom pieces are 1¾ inches by 5½ inches; the back 4½ inches by 5½ inches, and the ends 1¾ inches by 4 inches, and 1⅜ inches by 4 inches, respectively. After these parts are assembled a strip ⅛ inch square and 4 inches in length should be tacked on one side, as shown. Next, tack a similar strip on both the top and bottom pieces. This strip should be 4¾ inches in length, leaving a space of 1/16 of an inch. A second strip should be 5 inches in length.

A piece is then made, as per dimensions, at A, Figure 2. This is to hold the glass case in place. The method of stringing the hot wire is further shown at B, Figure 1. The thumb-screw, C, is intended to take up undue expansion of the wire, and bring the pointer back to the zero position. The nut through which

the adjusting screw passes (F, Figure 3), should be soldered to the brass strip conecting the binding posts. The movement for the mechanism is taken from an old clock, and is screwed to the back of

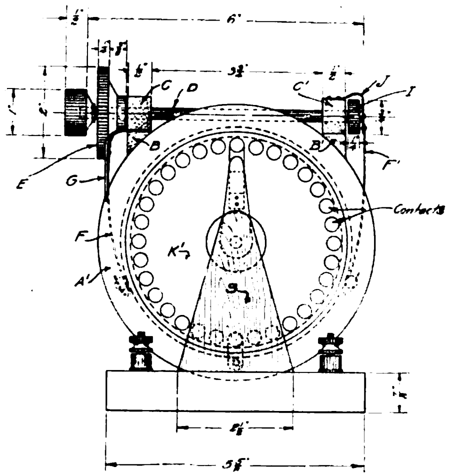


Fig. 2, First Prize Article

the case. For an indicator, solder on the shaft of the wheel, a No. 28 copper wire as at E, Figure 1, and directly opposite on the periphery place a drop of solder as a balance.

A piece of No. 30 wire sufficiently long and having a loop twisted at the end, has one end slipped over the hot-wire and the other end over a small steel pin projecting from the top movement. The dial is raised from the base of the glass by two small pieces of wood, ⅛ of an inch in height, and the indicator is allowed to pass under, which, of course, greatly facilitates the reading.

The operation of this apparatus is as follows: The current passes through the wire and expands it; the tension of the hair spring, therefore, takes up the slack, thus moving the indicator along the scale. Care should be taken that the tension of the hair spring is not so great as to prevent the wire contracting and bringing the pointer back to zero. The "hot-wire" should be of No. 32 or No. 34 German silver. A few turns of it should be wrapped about the adjusting screw. If the experimenter has access to a standard ammeter he may calibrate this instrument by comparison.

Frank O'Neill, *California.*

Note.—Amateurs intending to construct an instrument of this type should take particular care to select a hair spring having great resilience and lightness.—Technical Editor.

THIRD PRIZE, THREE DOLLARS

A Receiving Tuner of the Pancake Type

The following is a description of a receiving tuner of the pancake type which I have constructed and with which I have obtained excellent results. It is intended that this tuner should be employed with an aerial at least 150 feet in length and 50 feet in height.

It will be observed from the drawings that the primary winding is stationary on one end of the brass rod, D, while the secondary winding slides over the rod, D, so that the coupling between the two

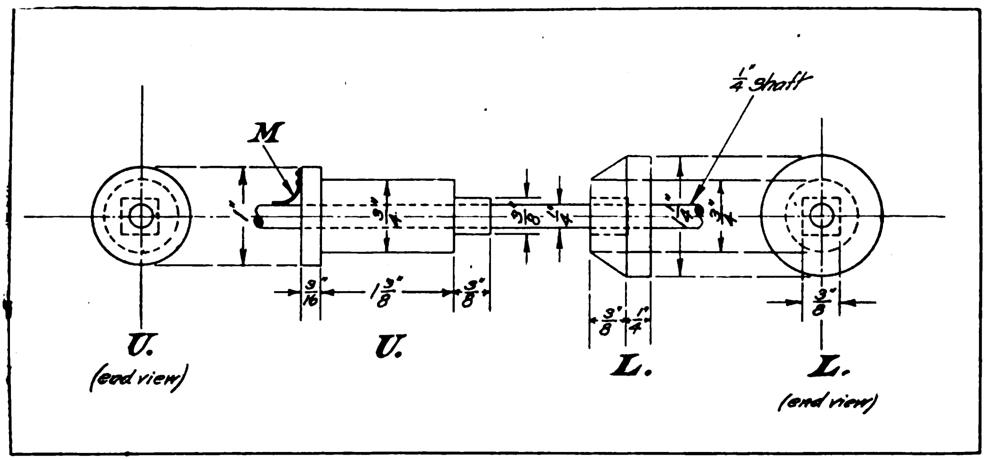


Fig. 3, First Prize Article

windings may be varied as desired. The secondary winding is also built on a swivel so that the coupling between it and the primary winding may be adjusted by simply turning the secondary winding at right angles.

The primary winding has 100 turns of

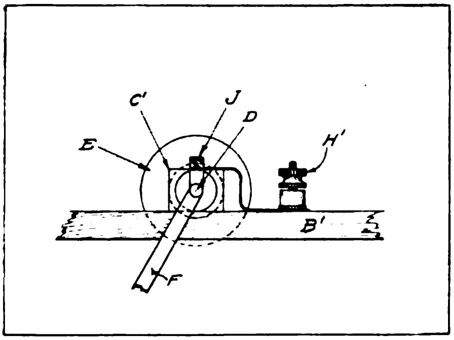


Fig. 4, First Prize Article

No. 20 green silk covered wire, the secondary winding 150 turns of No. 24 green silk covered wire. "Tap-offs" are taken from the primary winding to a multiple point switch having 20 points. A similar number of "tap-offs" may be taken from the secondary winding.

The turns for both the primary and secondary windings are started from the outside edge of the disc and not from the center. The discs for supporting these windings may be made of hard wood such as maple or, if desired, of hard rubber.

That portion of the discs on which the multiple switches are mounted is slightly raised, as shown in the sketches. This is intended to facilitate the bringing out of the taps from the windings. The construction of this tuner should readily be understood from the drawings which are made to scale.

J. F. Serex, *California.*

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE

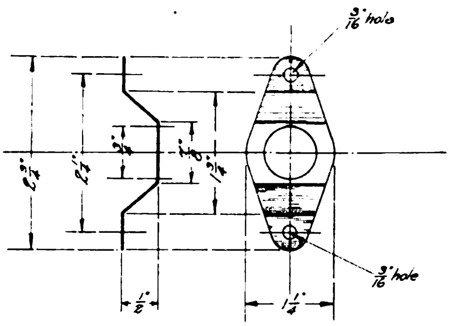
An Efficient Receiving Tuner

The receiving set I am about to describe is the most compact and efficient I have ever used. I believe the drawings furnished are clear enough not to need a special description, but for those who may desire to construct a similar instrument the following dimensions are given:

1 cardboard tube, 4¼ inches in diameter by 6 inches in length; 1 tube, 3¾ inches in diameter, by 5½ inches in length; 2 end pieces for primary winding, 6 inches by 6 inches by ½ inch, 2 end pieces for secondary winding, 3½ inches in diameter; ½ dozen contacts and switch for secondary winding; 2 3/16-inch round brass rods, 16 inches in length for secondary winding; ½ pound No. 24 enamel wire for primary winding, and ½ pound No. 36 S. S. C. wire for secondary winding. The base for the receiving tuner should have dimensions of 18 inches by 8 inches by ½ inch.

It is intended that the same case should hold the variable condensers, the fixed condensers and the battery. The case, therefore, should be made of the proper size to get the above-mentioned instruments into it.

The detectors used are of the Perikon and Silicon type mounted on a sheet of hard rubber on the side of the primary winding of the receiving tuner. Switch A selects the detector to be used, switch B varies the voltage of the battery, while switch C cuts the battery in or out of



T.

Fig. 5, Second Prize Article

the circuit. Five flashlight batteries were found to be just suited to the above set, while the variable condensers for the secondary winding were of the small Murdock type.

The experimenter may employ any standard method of wiring up his tuner, but I prefer the diagram of connections given in Figure 2.

The set as described is especially

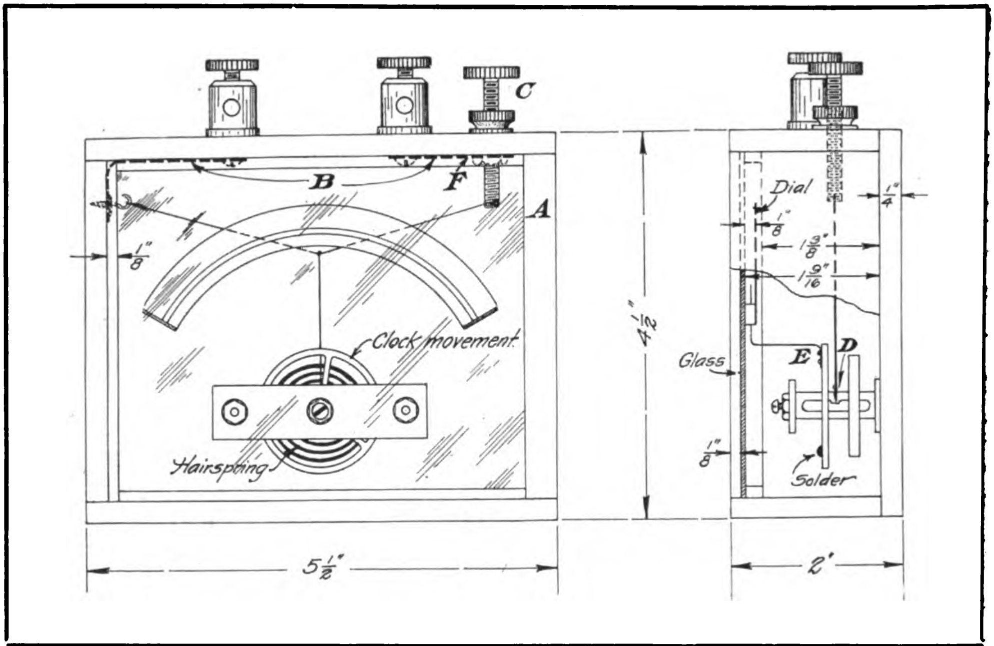


Fig. 1, Second Prize Article

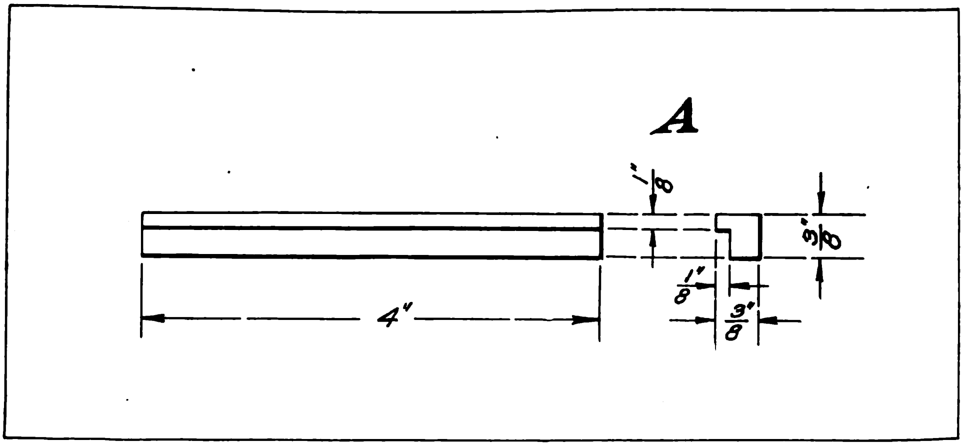


Fig. 2, Second Prize Article

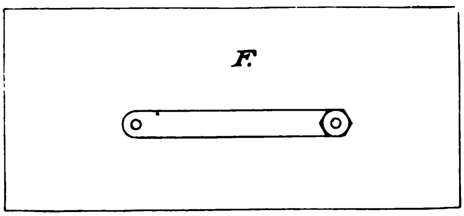
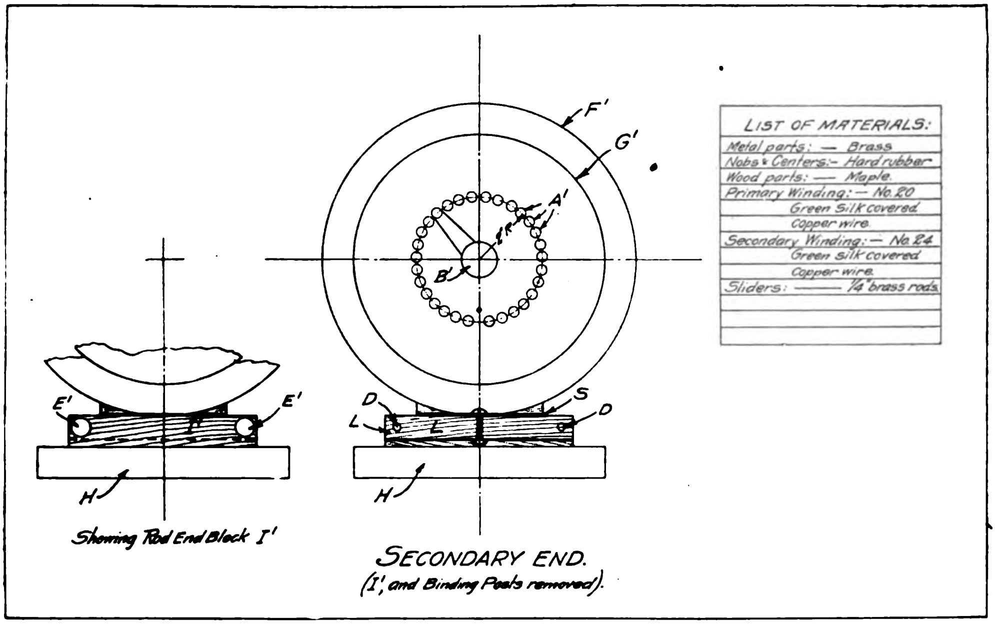


Fig. 3, Second Prize Article



Drawing, Third Prize Article

adapted for portable work because of its compactness, and is therefore recommended to the Boy Scouts. I have found it an easy matter to receive signals from the government station at Arlington, Va., on a portable aerial 60 feet in height by 50 feet in length composed of 4 No. 14 wire strung on 9-foot spreaders. Furthermore, I have repeatedly copied Colon, Panama, with this set on my permanent aerial which is 80 feet in height and 100 feet in length. It consists of six stranded copper wires strung on 15-foot spreaders.

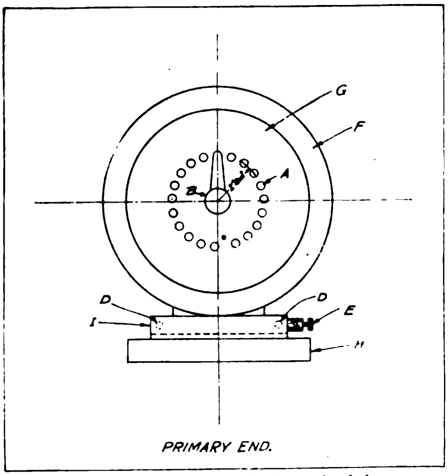
Bayard D. Alcorn, *New Jersey.*

Note.—We cannot understand why our contributor has connected two such condensers in series unless the capacity of either one is too large for the purpose. Furthermore, we are of the opinion that better results will be obtained if the head telephones are connected in shunt to the fixed condensers rather than across the terminals of the receiving detector.—Technical Editor.

HONORARY MENTION

Connections for Results

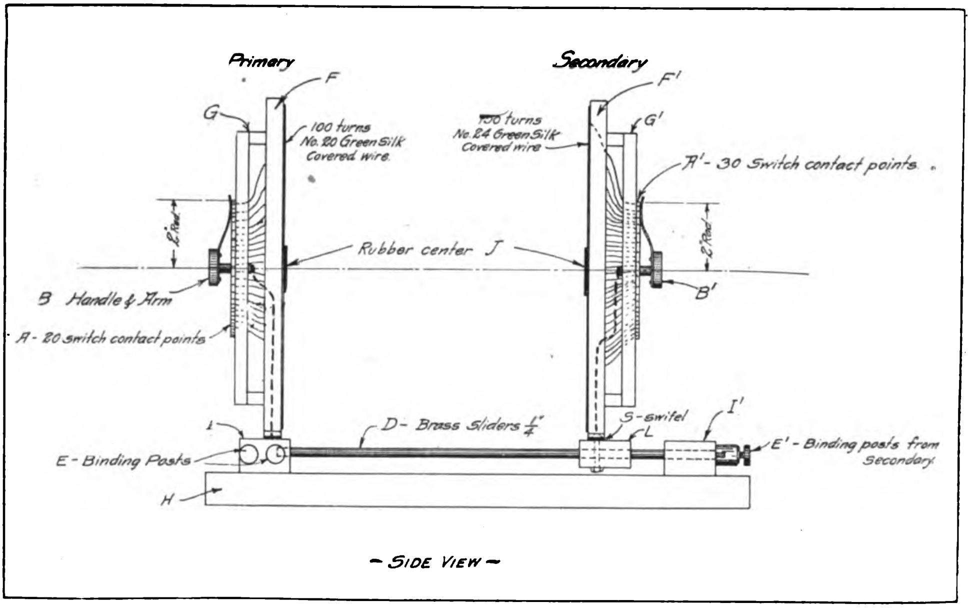
The accompanying diagram of connections for a double slide tuning coil, detector, fixed condenser and head telephones is by far the most efficient I have ever used, and I have tried every hookup I have ever seen in print. As far as tuning is concerned, it is not any more selective than the ordinary method of connection, but for bringing in that "long distance fellow," it is superior to all. With the circuit as shown, I have copied NAX (2,100 miles) on an aerial 75 feet



Drawing, Third Prize Article

in length and 50 feet in height, using a small Perikon detector and a five dollar set of head telephones.

Specific directions for tuning cannot be given, but in general the following advice is offered:



Drawing, Third Prize Article

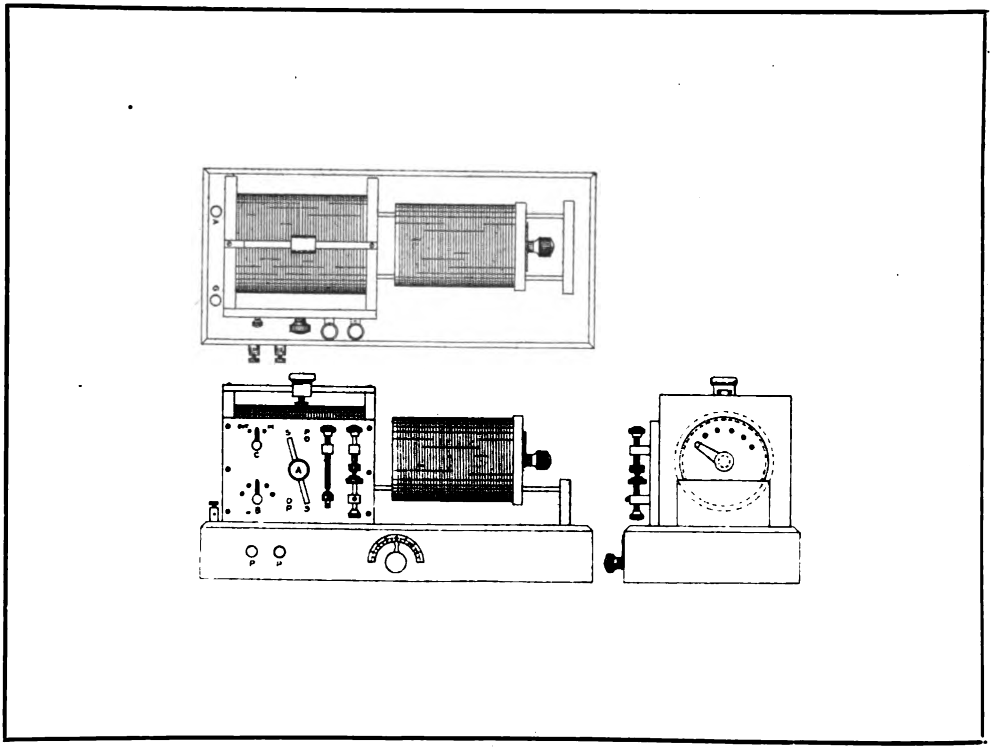


Fig. 1, Fourth Prize Article

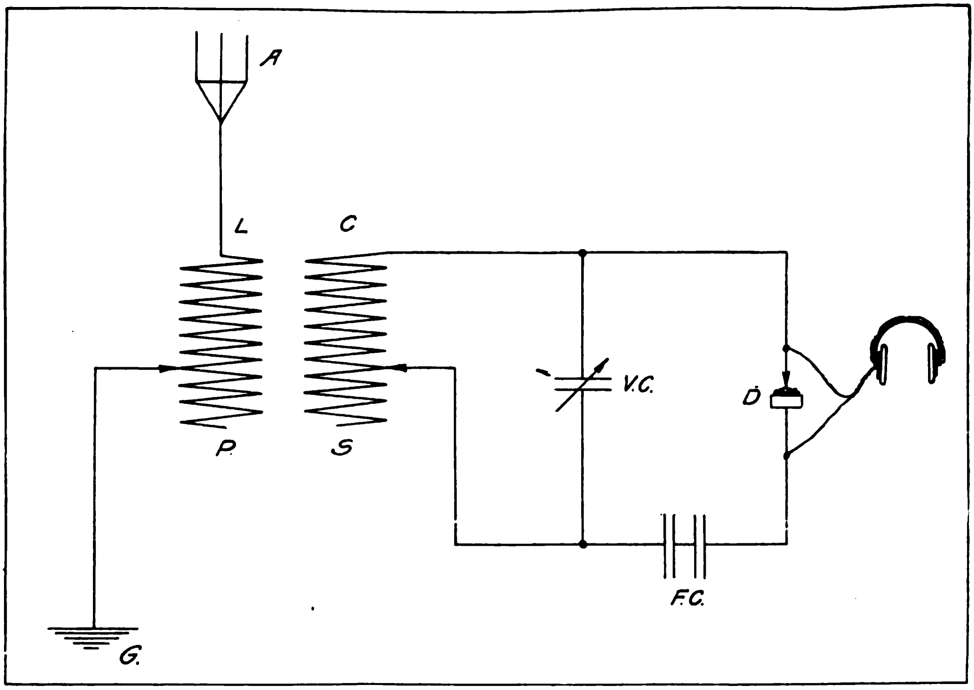


Fig. 2, Fourth Prize Article

and down along the coil until the desired station comes in louder. If this point is not over one-fourth of the way up the coil from the slider, A, the station can probably be brought in louder by moving the slider A, up the coil past the slider, B, usually about three or four times the distance from B to the end of the coil.

It makes practically no difference whether the head telephones are connected across the detector or the fixed condenser; or, for that matter, the set will work very well indeed without any condenser in the circuit; the head telephones and detector being connected in series.

S. C. Beekley, *Pennsylvania.*

Note.—We agree with our contributor that for amateur purposes this is the most efficient hook-up that can be employed and it is recommended particularly to those who are just entering the radio amateur field. The method of connection shown is particularly valuable when receiving signals from transmitting stations employing long wave-lengths on a receiving aerial of small dimensions. We prefer that the head telephones be connected across the fixed condenser for the most efficient results.—Technical Editor.

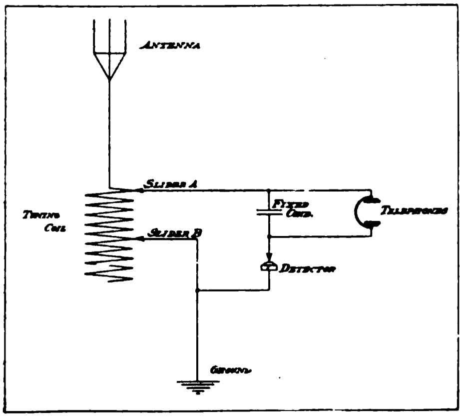
HONORARY MENTION

Comparing the Strength of Signals from Different Stations

It is often convenient to compare the intensity of signals from a station under different conditions, or to compare the strength of signals from different stations. Such measurements are particularly valuable in finding out the best connections for a receiving set or in general testing of mineral detectors. To actually measure the strength of the incoming signals requires elaborate apparatus, but for ordinary purposes a comparative reading is sufficient.

The only instrument needed for this is a potentiometer, preferably one with a sliding contact. Clapp Eastham's type is perhaps the best. Make a closely graduated scale to lay parallel with the slider-rod and solder a wire to the slider passing over the scale. If a rotary or other type of potentiometer is used, make some arrangement similar to this.

Figure I shows the connections for changing the potentiometer from one position to another. Switch A is simply two single-point switches arranged side by side so that one of the levers will make contact with both points. It is easier to operate if the two levers are connected with a strip of hard rubber or fibre. With switch A in position 2, and B open, connection is made for the intensity meter. When switch A is in position I and B is closed, the instrument becomes a potentiometer.



Drawing, Honorary Mention Article, S. C. Beckley

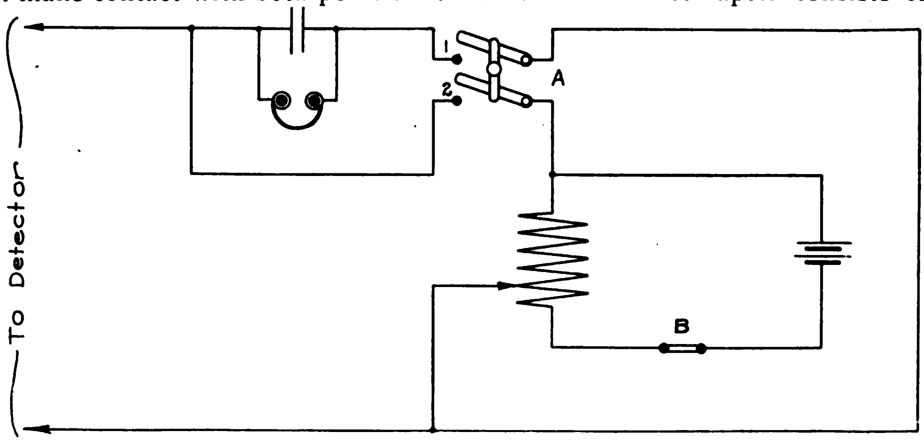


Fig. 1, Honorary Mention Article, Milton B. Sleeper

Figure 2 shows the connection for the intensity meter alone. It is well to keep A open when the meter is not in use.

When a signal is received, the slider is moved until the signal is just too faint to hear, and the reading on the scale noted. If the wiring is changed or a new instrument or crystal placed in the circuit, a second reading is taken. By comparing it with the first result, it can be determined if the signals are stronger or weaker. The same meter can also be connected in at other stations to compare the results obtained by different operators.

MILTON B. SLEEPER, *Massachusetts.*

HONORARY MENTION

An Independently Operated Spark Coil Interrupter

The accompanying drawing illustrates a new type of independent vibrator which I have used with some success. The note produced by this device is by no means musical, but at the distant receiving station produces a sound like escaping steam, easily readable through static and other interferences. This interrupter consists of a magnet or solenoid which is supplied with 60-cycle alternating current, the armature, B, being drawn to the magnet once per alternation.

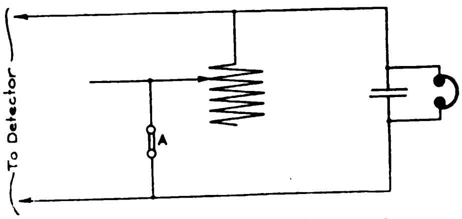
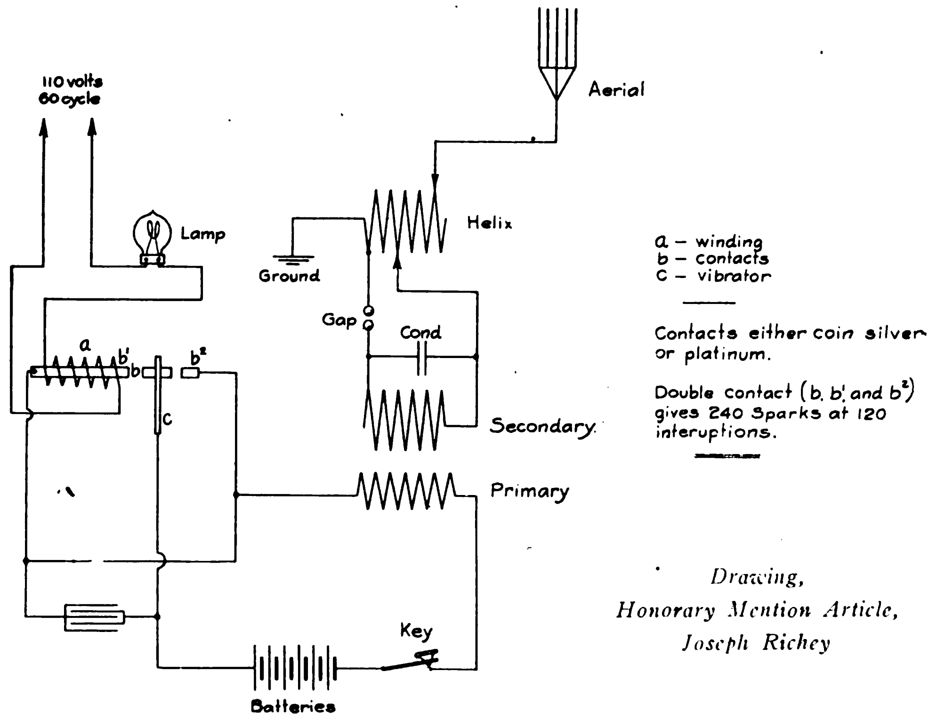


Fig. 2, Honorary Mention Article, Milton B. Sleeper



Drawing,
Honorary Mention Article,
Joseph Richey

The two stationary contacts, B1 and B2, close the circuit from the batteries to the primary of the induction coil as shown. On account of the fact that we have two stationary electrodes 240 sparks are produced in a second of time from the 60-cycle source of supply.

A pony relay has been used with some success in place of the magnet as shown. A condenser which is shunted across the contacts, is constructed as follows: Five sheets of tinfoil thirty-six inches in length are separated by thin paraffin paper, two sheets being connected to one side and three sheets to the opposite side. The entire condenser is wrapped in concentric form as desired.

I have used this interrupter in connection with a 1-inch coil and have reached a receiving station six miles distant. I consider this good work, owing to the hills and iron ore deposits in this vicinity; furthermore my station is situated in a valley.

JOSEPH RICHEY, *Pennsylvania.*

LONG DISTANCE COMMUNICATION

The students in the radio class of the East Side Y. M. C. A., 153 East 86th street, New York City, have finally succeeded, after a series of experiments covering several weeks, in establishing wireless communication with various high-power stations in Europe. Messages are received from the Goldschmidt high-power station at Hanover, Germany, and the Telefunken station at Nauen, Germany. The Marconi, Glace Bay, Nova Scotia, and Clifden, Ireland, stations are heard regularly, the messages sent between these two points being used for code practice. The "KHX" station at San Francisco is heard regularly on the evening press schedule with Honolulu. Messages have also been copied from the new government station at the Exposition Grounds in San Diego, Cal.

In view of the unfavorable local conditions and the fact that signals have not been received heretofore at enormous distances, the students are well pleased with the accomplishment. The apparatus employed has been specially designed for the purpose.

Between the Log Lines

Editor's Note:—All commercial wireless operators are required to keep a record of communications sent by wireless to and from vessels and shore stations, setting down also any incidents of the wireless traffic which serve as a guide to the heads of the department. The record is called a "log" and is turned in by the operator on the completion of each voyage. Land stations, too, send in reports regularly. For the most part these documents are made up of an uninteresting mass of data, of value only to traffic officials; but occasionally a note of human interest creeps into an entry. Sometimes the incidents are humorous, and often they are dramatic. The few random extracts printed on this page give some idea of the highly diversified life of the commercial operator of today.

AT 10:30 A. M., on the morning of January 25, Operator Swanson of the Saratoga jotted down the following interesting entry: "KVG (Algonquin) working, says their propeller has been lost and is trying to get a ship to tow them in. I have advised our Commander." And then, nineteen minutes later: "WHA (Hatteras) tells NAN (Beaufort) that a two-masted schooner is ashore off the life saving station near the south end of outer slew. High seas are preventing the life savers from reaching the wreck."

* * *

Reference to this incident is also found in other logs, Operators Makenzie of the City of Atlanta, and Robinson of the Creole among others, noting that they have relayed traffic relating to the mishap. As far north as Boston, Operator W. S. noted that he did not miss anything, and reported "All signals good here."

* * *

The excitement extended also to the El Norte, besides which Operator Lohman later noted that the Antilles was standing by to take the crew off the schooner Mary L. Baxter, "leaking badly 85 miles south of Diamond Shoals." The crew of nine men was eventually taken off by the El Valle.

* * *

The operator in charge of one of the most important stations on the Atlantic coast noted on January 29, at 2:45 P. M. that the boredom of a temporary lull was enlivened by some canned Caruso, transmitted through the air by a wireless telephone. Fifteen minutes later the entertainment had switched to banjo music, and was as "plain as if in this room." Very seriously, his log calls the attention of the traffic officials to the phonographic breach of neutrality—the banjo selection being "It's a Long Way to Tipperary." Five minutes later the phone experimenter must have received some ether-waved intimation that the universally beloved Caruso was to be preferred, for at 3:50 P. M., so the log-keeper announces, everything was so plain he had only to shut his eyes to dream of happy days in the Mediterranean.

* * *

Various logs from both ship and shore stations lead one to believe that by careful tuning the numbered code of warships may be heard at frequent intervals.

* * *

It is also revealed that Jacksonville and Miami are entering into keen competition for message traffic these days. When a ship in that communication zone sends traffic to WJX the active men at WST feel slighted—and this, of course, works both ways.

* * *

Operator Stevens on the Jamestown gives some indication of resourcefulness in his log entry, that at 7 A. M., January 31, he called KOB (Princess Anne) on his ship's steam whistle and told them by its blasts to listen for a message. The Princess Anne was at the Newport News dock and the Jamestown at anchor, so a little ingenuity was necessary to raise the operator not then on duty. The means employed was successful.

IN THE SERVICE

CONTINENT-TO-CONTINENT DIVISION

If a man has a bent toward certain activities he will follow it, notwithstanding the bait which destiny may hold out to lure him to other paths. This is the conclusion that must be drawn after a perusal of the life story of Henry Chadwick, manager of the operating department in the Broad street office of the Trans-Oceanic Division of the Marconi Wireless Telegraph Company of America, New York City. Chadwick was born in Bury which is near Manchester, England, in 1884, and arrived at the age when he was old enough to attend the Bury Grammar School without giving any indication that he was to find his real future in wireless. The years rolled on and, having completed his education, he entered a business office in Bury. Then he became an employee of a paper mill. At this juncture fate took her eyes off him for a brief period and there flashed into his brain the idea that he would like to enter the field of telegraphy. Wireless at that time was not included in his plans.

As the most feasible way of arriving at the end which he was desirous of reaching, Chadwick began practising upon a wooden telegraph instrument which he had constructed. Thus, with his energies directed toward becoming a telegrapher, Chadwick, after two years spent in the paper mill, entered the British Post Office service. There he remained for two years leaving the service to become an employee of the Commercial Cable Company in Liverpool. He was afterward detailed at the cable station at Waterville, Ireland.

Wireless came directly to his attention in 1905 when he left Europe to enter the office of the cable company in New York City. One of the features attracting his notice on the steamship on which he embarked was the radio equipment, and when the vessel reached American waters he had absorbed no small store of knowledge regarding the value of wireless. While he was in the employ of the cable company he began a course of study with the object of qualifying as a member of its engineering department, but wireless was still in his thoughts. This is shown by the fact that he joined the forces of the Marconi Company in July, 1914.

Upon the opening of the trans-Atlantic station at Belmar, marconigrams will be sent from the office of the Marconi Company at 42 Broad street, by direct automatic multiple wire circuits to the New Jersey station, which connects with those in Towyn and Carnarvon, Wales. When the high power station on Cape Cod is opened wireless communication will be established with Norway, Sweden, Denmark and Russia. This service will be connected with the Marconi office in New York. Thus, it will be observed, Chadwick as manager of the operating department in the Broad street office will not be lacking in responsibility.

Chapter XII

THE radio-goniometer or direction finder is a specially-designed receiving apparatus for determining the direction of a wireless telegraph transmitting station at a given receiving station. The device was primarily designed as an aid to navigation, enabling the officer of a vessel to make observations and establish his position independent of weather conditions, such as fog, etc. It is applicable in many other ways also, and can be employed to advantage by armies and navies; by means of it a hostile wireless station may be definitely located or the direction of the enemies' battleships, while in radio communication, "sensed."

Government inspectors are likewise enabled to "round up" interfering amateur stations, by using the direction finder. The apparatus is even of considerable value for ordinary receiving purposes (short range work), for it allows the receiving operator, when the ether in a given locality is congested, to "screen out" unwanted wireless signals. It is only recently that the latter advantage seems to have been fully realized.

The Marconi direction finder is an adaptation of the apparatus originally evolved by Messrs. Bellini and Tosi; however, the device as produced by these inventors was not adapted to ship work. Improvements were made by the Marconi Company and the equipment is now turned out in a form entirely satisfactory for use by navigators giving, as it does, a high degree of accuracy.

The complete equipment consists of a goniometer with the necessary appliances for control (Figure 8), a tuned wireless telegraph receiver (Figure 9), a tuned buzzer tester (Figure 10), and an angle divider (Figure 11).

THE DIRECTION FINDER AERIALS

A distinguishing feature of the direction finder equipment is the use of two closed circuit looped aerials having the form of an isosceles triangle as shown in Figure 1. These aerials bisect each other at right angles and also hold an angle of 45 degrees with the bow and stern line of the vessel.

It is important that the aerials be placed in a somewhat clear space on the deck and that the two loops have identical dimensions. The wire should be held taut and firmly in place. The energy collected by the aerials, from a passing electro-magnetic wave, is made to flow through a specially designed set of excitation coils, setting up a magnetic field which acts upon a third coil known as the exploring coil. The latter coil carries a pointer which moves over a 360-degree scale and gives the sense of direction of any transmitting station. This portion of the apparatus is known as the goniometer, the windings for which are clearly shown in the photograph (Figure 2). It will be referred to again hereafter.

The sketch (Figure 3), is a plan view of the two triangular aerials, as previously described, showing their relative positions to the bow and stern line of a given vessel (marked B and S).

Before entering into a discussion concerning the details of the circuits, it may be of value to consider the diagram in Figure 4. Let A and B represent two sides of a single loop of the direction

finder aerial, and the arrows, the direction of the flux in a passing wireless wave, then the maximum flow of energy will take place in this loop only when it bears

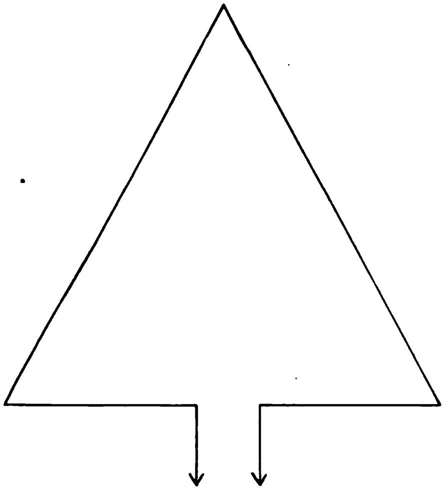


Fig. 1

the position to the plane of the passing wave as shown. Furthermore, a litttle study of the diagram will show that the energy set up by this flux in Side A is in opposition to that set up in Side B; but if the two sides of the loop are separated to a certain degree, the energy in Side B will be set up an instant later than at Side A; hence an electro-motive-force. the resultant of the two forces, will flow around the loop, AB. The magnetic flux of the coil, L, corresponding to this current, will act upon the exploring coil, L-2, where it is again transferred to coil L-3, and associated apparatus and made audible by the detector and head-telephones as indicated.

It is likewise plainly evident that if the loop, AB, is turned so that its plane is at right angles to the plane of the arriving energy both sides of the loop will be acted upon equally and at the same instant. The EMF's of both legs will, therefore, be equal and opposite, resulting in no current flow.

If, however, the loop, AB, is acted upon at any other angle than a right angle EMF will flow, the intensity depending upon the cosine of the angle, which the advancing flux makes with the loop.

The description just given does not take into account the phenomena produced when both loops are employed and the consequent effect on the goniometer coils. This matter will be taken up in a later paragraph. We shall first proceed to a description of the circuit of the direction finder complete.

THE CIRCUITS COMPLETE

Careful inspection should now be made of the diagram of connections shown in Figure 5. The triangular loop aerial, AB, is connected through the variable condenser, K, to the excitation coil L. The loop aerial, CD, is connected through condenser, K-1, and excitation coil, L-1. The condensers, K and K-1, have identical values of capacity and are altered simultaneously in value by a handle mounted on the top of the box (See Figure 8).

The magnetic field produced by the coils, L and L-1, combine and act upon the exploring coil, L-2; the method will

Fig. 2—Goniometer coils and exploring coil

be more clearly understood from the photograph (Figure 2). The energy set up in L-2 by the oscillatory current flowing in the coils, L and L-1, is transferred to the inductance coil of the local detector circuit, L-4, by the coil, L-3.

The coil, L-2, the variable condenser, V, and the coil, L-3, constitute an intermediate circuit similar to that employed in the well-known Marconi valve tuner.

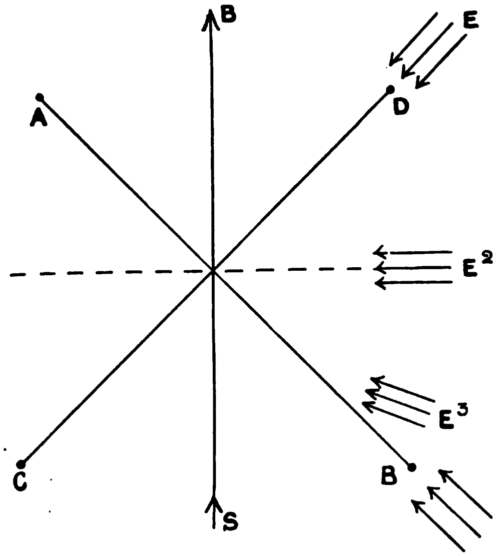


Fig. 3

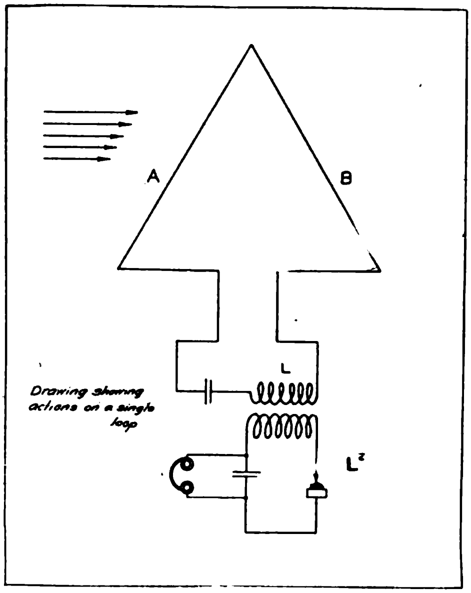


Fig. 4

The value of coupling between the coils, L-3 and L-4, is varied as desired by a knob mounted on the side of the tuned receiver.

The detector circuit consists of the inductance coil, (of fixed value) L-4; the billi-condenser, V-1, in shunt; the fixed condenser, V-2; the head telephones, H; the potentiometer, P, and the battery B. Two detectors are employed for this work, one a crystal of carborundum, the other a crystal of cerusite, either one of which may be connected in the circuit as desired. When the cerusite detector is in use the battery and potentiometer are cut out of the circuit.

THE TUNED BUZZER TESTER

The direction finder outfit also includes a tuned buzzer testing equipment, which may be set to emit waves of either 300 or 600 meters in length. The buzzer box has 4 holes, one in each corner, through which the four leads from the two-looped aerials pass. These holes are marked S. F. (starboard forward), S. A. (starboard aft), P. A. (port aft) and P. F. (port forward). Care should be taken to bring the corresponding leads from the loop aerials, through the proper holes. The leads from both aerials are now in inductive relation to the tuned buzzer circuit; hence the aerials and, in fact, the entire apparatus may be pre-adjusted to a given wave-length, removing all doubt in this respect.

It is sufficient for the time being to say that for practical operation of the apparatus, the aerial circuit, the intermediate circuit and the local detector circuit must be accurately tuned to resonance and the incoming wave. The exploring coil is then turned on its axis until the maximum strength of signals is secured in the head telephones. The pointer on the coil, L-2, will then lie in the direction of the transmitting station.

We may now return to a description of what takes place when the two-looped aerials are acted upon by an arriving electro-magnetic wave. Reference is again made to Figure 3.

HOW ENERGY IS COLLECTED

If the energy from a given transmitting station arrives in the general direction, E, the loop, CD, is set into excitation while the effect on the loop, AB, is nil. To receive the maximum effect of this energy, the exploring coil must, in this case, lie parallel to the goniometer excitation winding connected to the terminals of the loop, CD.

Again, if the energy arrived in the direction, E-1, the effect of the loop, AB,

is maximum and on CD nil. Hence the exploring coil must lie parallel to the goniometer winding connected to the loop, AB, to receive this energy, and the pointer will lie along the direction, E-1.

If, however, the energy from a distant station comes in the direction, E-2, both loops are acted upon simultaneously and equally and an oscillatory current will flow through both excitation windings of the goniometer. The magnetic fields set signals will cause the pointer to lie along the direction, E-3.

MAGNET FORCES IN THE GONIOMETER

Careful observation of the sketches in Figures 6 and 7, may assist in showing the manner in which a resultant magnetic field is produced when both aerials are acted upon simultaneously. It should be remembered that in order to set up the

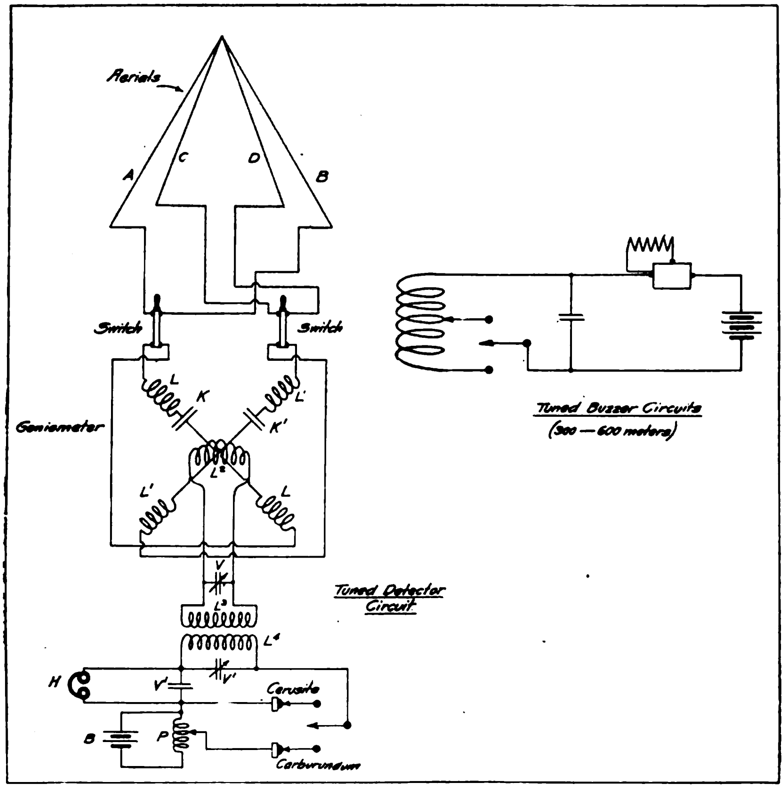


Fig. 5

up by the two coils will combine and produce a resultant field, so that the pointer of the exploring coil, for maximum signals, will be parallel to a line drawn midway between D and B, A, and C (dotted line).

Let, however, the energy arrive in the direction, E-3; in this case the loop, AB, will receive the maximum energy of the advancing wave, while the loop, CD, will be acted upon feebly. The result in the goniometer coils will be the production of a magnetic field, which for maximum maximum value of energy in the exploring coil the windings of the latter are always at right angles to the magnetic lines of force inside the goniometer windings. The diagram in Figure 6 is, in fact, a plan view looking down from the top on a single coil connected to one of the loops as described. The direction of flux with a given current flow, and the corresponding position necessary for the exploring coil in order to receive the maximum value of energy from this flux, is clearly indicated. The position of the

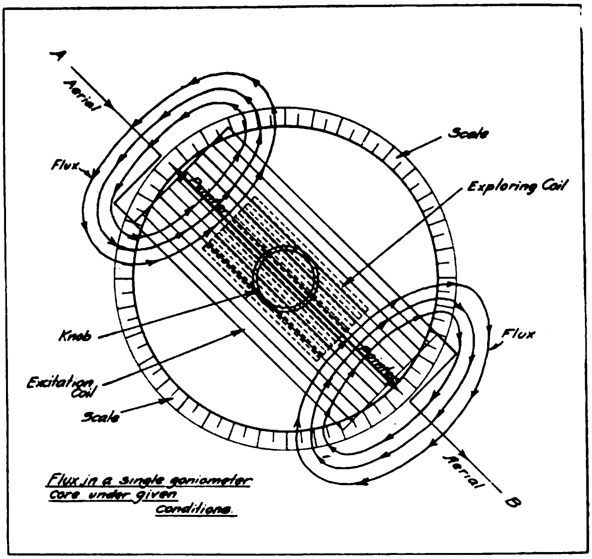


Fig. 6

pointer on the scale and its relation to the coils is also shown.

Figure 7 is a plan view looking down from the top on the two coils of the goniometer and shows by the dotted lines the resultant magnetic field when both aerials are acted upon at one time and with equal intensity. If energy flows in the coil, AB, alone and the current in the windings flows in the direction shown, the corresponding magnetic lines of force will take the general direction shown by the heavy line (the N and S polarity being as indicated). And again, if only the loop CD, were acted upon, then the general direction of flux in the corresponding goniometer coil will be as shown. But when energy flows in both coils at the same time it is evident that the corresponding fluxes are at right angles and a resultant field is produced, which will take the path, F and F-1, and the pointer on the coil will lie in the direction, P and P-1. The exploring coil must, therefore, be in the position shown to receive the maximum effect from this flux.

GENERAL INSTRUCTIONS FOR OPERATION

(1) As a matter of convenience, the box containing the goniometer coils and the variable condenser should be so placed that the zero position of the scale coincides with the bow and stern line of the vessel.

(2) The tuned buzzer circuit is then set into operation at either 300 or 600 meters, depending upon which wavelength it is desired to receive.

(3) The coupling knob on the tuned receiver is turned to 90 degrees.

(4) With the buzzer in operation, the condenser, connected across the intermediate circuit, and the billi-condenser are altered in capacity (simultaneously adjusting the detector) until maximum response is secured in the head telephone.

(5) When the foregoing adjustments have been made, the capacity of the condensers in the antenna circuit is altered by the knob on the top of the goniometer box until a still greater response in the head telephones is obtained. It may then become necessary to slightly readjust the values of capacity in use at the intermediate circuit condenser and the billi-condenser.

(6) When the two loop aerials are in use and the buzzer is in operation the maximum strength of signals from the buzzer should be obtained when the pointer is at zero. The signals should gradually decrease in strength as the pointer is moved toward 90 degrees.

(7) When the two aerials are in use

zero signals should be obtained when the pointer is in the position 90-90 degrees.

(8) When one of the aerial loops is disconnected by means of the switch on top of the goniometer box the maximum signal is received with the pointer at 45-135 degrees in one direction, and the zero signal with the pointer 45-135 degrees in the opposite direction. The reverse condition takes place when the second loop is in use alone.

(9) If when the loops are thus tested singly it becomes necessary, in order to secure the maximum response, to alter the capacity of the intermediate or the billi-condenser, it is a sure indication that the loops are unsymmetrical and therefore out of balance. Identical positions should be observed on both loops. Steps should be taken immediately to correct this error which undoubtedly lies in the aerial. A slight compensation for this unsymmetrical condition may be made at the variable condensers inside the box by means of two small adjusting screws.

(10) The strength of signals in one loop should be identical with that in the other. If not, it indicates a bad connection in one of the aerials.

TO FIND THE DIRECTION OF A STATION

(1) The station whose direction is to be determined, if not already in the act of sending, should be called and requested to send a test letter for two or three minutes, making sure to disconnect the two loop aerials of the direction finder by switches mounted on the top of the goniometer box.

(2) When a reply is received on the ordinary receiving equipment the main ship station is put out of action, even to the disconnecting of the main aerial from the earth, which, if left in the circuit, will seriously affect the accuracy of the goniometer reading.

(3) Next, close the two switches for the loop aerials and swing the direction finder handle until the maximum strength of signals is obtained. This should not be a difficult operation as the apparatus

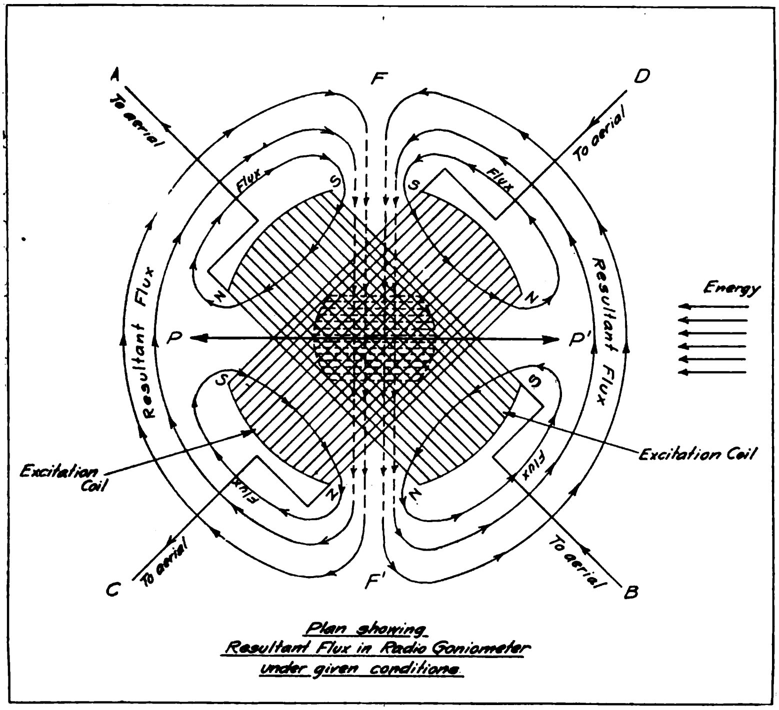


Fig. 7

has previously been adjusted to the maximum degree of sensitiveness and the proper wave-length adjustment by means of the tuned buzzer.

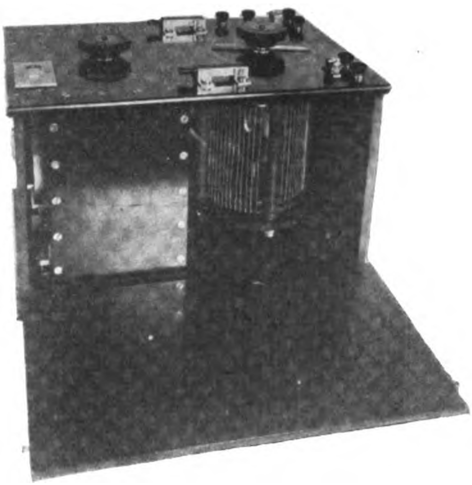


Fig. 8—The goniometer

The pointer will now indicate on the goniometer scale the direction of the transmitting station the signals of which are being received—that is to say, it shows the direction in reference to the bow and stern line of the vessel.

(4) If signals are received and are not sharply defined, having about equal strength over a considerable portion of the scale, the position should be noted where the signals die to zero and a mean of the two readings taken. This reading is facilitated by the angle-divider furnished with the set.

(5) Before transmission is again resumed care should be taken to disconnect the two loop aerials from the goniometer by means of the switches as previously described, and also to put the detector switch at zero.

It should be understood that the direction finder only gives the sense of direction in reference to the bow and stern line of a vessel and not the geographical direction of the wireless station which, of course, must be obtained by the readings of the regular ship's compass. To be more comprehensive: The direction finder gives the angle which the energy from the transmitting station makes with the center line of the vessel.

For instance, if the pointer of the direction finder indicates that the transmitting station has a general direction 20 degrees off the port bow, it does not show whether that station is 20 degrees to the port bow or 20 degrees to the starboard quarter. In the case of land stations there need be no doubt in this respect as it is generally known whether the station is to the port or starboard side of the vessel. There is never much doubt as to whether a ship is approaching or receding from a land station, for by the reverse interpretation the land station would be located at sea—an obvious absurdity.

If, in case of a heavy fog, the signals from another ship indicated that it bore a direction over the bow and stern line of the vessel and the signals from this ship became of gradually increasing intensity, it would, of course, be an indication that the ships were approaching but would not show whether bow-on or in the same direction. A wireless message sent to the ship asking her course, would, of course, remove all doubt and enable the navigator to avoid a collision.

Readings may be taken simultaneously

Fig. 9—The tuned receiver

of two land stations and the position of the vessel located by the well-known method. Readings may be taken from a single station and the ship moved forward in a straight course to a definite distance, and a second observation made. The data obtained in this manner is sufficient to establish the position of the vessel.

Fig. 10—The tuned buzzer tester

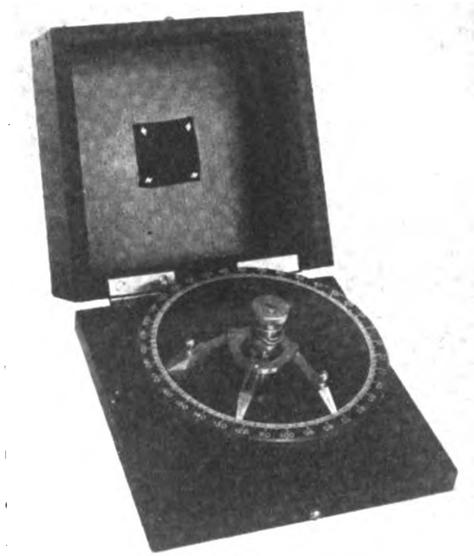


Fig. 11—The angle divider

An interesting application of the direction finder is the assistance it gives in locating a distressed vessel in foggy weather or after darkness. After the distress signals have been received, the position of the distressed vessel transmitted and certain information given to the relief vessel to enable the commander to know what direction he shall take, the distressed vessel is then asked to make the test letter "V," or any other prearranged signal. The direction finder of the relief vessel is then put into operation and a general direction of the signals from the distressed vessel obtained.

The relief vessel is then swung by the helm until the bow and stern line of the vessel coincide with the position of the pointer on the direction finder where maximum signals are obtained. In this manner the relief vessel can be kept on a direct course and the distressed vessel located in the quickest possible manner.

When entering ports like New York where the atmosphere is at times congested with wireless traffic, a direction finder has been employed in a most efficient manner for eliminating unwanted signals. First one loop is thrown in the circuit; if the station desired is not heard the second loop is thrown in and a test made. If the signals are received on this loop, 50 per cent. of the local interference under some conditions may be wholly eliminated or at least weakened to such an extent as to be negligible. Or, if desired, both loops of the direction finder may be employed and the pointer of the goniometer set in the direction of the station from which signals are being received. It is certain that in this direction the maximum strength of signals will be received and those of all other stations not on the same general line will be reduced or wholly excluded.

Under favorable conditions bearings may be taken with the direction finder within two or three degrees of accuracy; the error due to the instrument itself does not exceed one degree. The range of this apparatus with a carborundum detector is from 40 to 50 miles, but with a cerusite detector, it may be extended to 160 or 170 miles which is ample for navigation purposes.

Experiments are now in progress to increase the effective range of the direction finder.

VESSEL CRUSHED IN THE ICE

George Keefe, Marconi operator on the steamer Iowa, showed his devotion to duty when the vessel was crushed in the ice in Lake Michigan, off the mouth of the Chicago River, on January 3, by remaining at his post to send the S O S until five minutes before she sank. He and the others on the hapless craft, including one woman, made their way to safety by walking for a mile and a half over the ice to shore.

The Iowa, steaming from Milwaukee to Chicago, with a crew of seventy and one passenger, was in sight of the harbor at the latter city when she fell into the clutch of the ice floes. Captain Stufflebeam, commander of the Iowa, sent the following marconigram at fifteen minutes to eight o'clock on the morning of the wreck to the Chicago offices of the Goodrich Transit Company, which owned the steamer:

"In open water off the C. H. Harrison crib."

Another wireless message was sent from the Iowa at fifteen minutes to ten o'clock to the effect that she was "making good progress." Then at thirty-five minutes after ten o'clock came this message:

"Send tug at once. Fast in ice. Ice running hard. Starboard forward planking struck loose. Leaking badly."

Rescue craft were dispatched at once, but in the meantime those on the Iowa had made their way to the ice.

Keefe told the following story of the wreck:

"Four miles off the government lighthouse we got wedged in the ice. We fought it from five to nine o'clock. Then the ice began to close in on us and we saw the impending doom of the ship. I sent a message, almost a frantic call, to the Goodrich office, and when she started to sink I sent the S O S."

F. H. Mason, superintendent of the Great Lakes Division of the Marconi Company, has written to Keefe saying that "it has given me a great deal of pleasure to know that you, like all of the other Marconi operators who have been put to the test, came through with flying colors. I wish to congratulate you on your conduct."

THE WAKIVA WRECKED OFF TAMPICO

Wireless telegraphy was employed in an effort to summon aid to the steam yacht Wakiva when she went on the rocks off the Tampico (Mexico) breakwater on the night of January 8. The vessel was abandoned and those on board were rescued by means of a breeches buoy.

The Wakiva, which was owned by Edward L. Doheny, of Los Angeles, Cal., left Tampico at half-past seven o'clock on the night of January 7 for Galveston with Marconi Operator P. Daniels in charge of the wireless. She was only a short distance from Tampico when the wreck occurred. Daniels at once sent out the S O S, which was picked up by the operators on several vessels.

Bound from Tampico for New York was the steamship Brabant, on which was Marconi Operator Guy H. Hawkins. When the Brabant was about fifty miles east of Tampico the operator on the steamship Edward L. Doheny called C Q and asked what vessel had sent out distress signals. He said that some craft had sent out the S O S, but that he did not get the signature. Hawkins then called C Q, asking who had flashed the S O S. Daniels responded to this message by again sending S O S and saying: "The Wakiva is sinking on Tampico Breakwater. Send help." Hawkins replied that the Brabant would arrive at the scene of the accident in about five hours.

The Doheny, the U. S. S. Sacramento and the steamship Energie afterward got into wireless communication with the Wakiva, and the Doheny sent a message to the yacht at ten minutes after nine o'clock to the effect that a boat had been sent to the assistance of those on the wreck. There was a heavy norther blowing, however, and the rough sea which it kicked up prevented the boat from reaching the wreck.

When the Brabant reached the wreck a breeches buoy had been rigged from the foremast of the yacht and anchored to a large concrete rock at the end of the jetty. This enabled all on board to reach shore safely.

THE WASHINGTONIAN SUNK

A rude awakening out of a sound sleep; a cry of "all men to the life-boats! a hurried scramble for place in the craft; then a three miles' pull scantily clad through the chill early morning darkness in a tumbling world of waters to a lightship where wireless communication was established with a passing steamship.

This is an epitomized version of the experience of Albert H. Randow, Marconi wireless operator on the Washingtonian of the American Hawaiian Steamship Company, when she came into collision with the five-masted schooner Elizabeth Palmer off Delaware Breakwater. The Washingtonian sank and the schooner was abandoned with her decks awash, no lives having been lost with the exception of that of a water-tender on the steamship. Neither the Washingtonian nor the Palmer carried passengers.

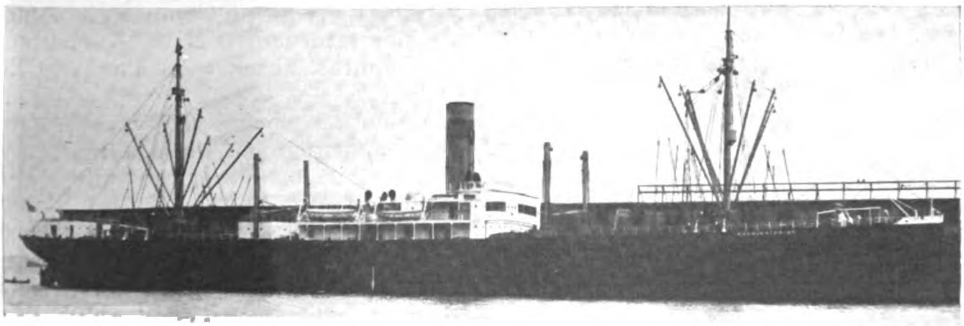
The Washingtonian, a large freighter, was on her way from Honolulu to the Delaware Breakwater. When she arrived in the neighborhood of the Fenwick Island lightship at twenty-five minutes after three o'clock on the morning of January 26, a light mist had overspread the waters. From out of this haze there appeared suddenly the outlines of the hulk of the Palmer. The schooner, with all sails set, struck the freighter just aft of her beam, tearing such a large hole in her side that she sank ten minutes after the collision.

Captain E. D. Brodhead, the commander of the Washingtonian, ordered the life-boats made ready and into them the crew of forty odd men tumbled. Randow was ready to send out the S O S call, but Captain Brodhead had given orders for all to leave the vessel and he therefore did not attempt to do so.

There were thirteen men and one woman—the wife of the steward—on the schooner. They finally left her to her fate and made their way to safety in a motor boat.

Albert H. Randow

Randow experienced considerable discomfort in the ride in the life-boat from the wreck to the lightship due to the fact that the weather was cold and he had left the ship only partly dressed. When the Washingtonian's people arrived at the lightship a wireless message was sent from the station there to the Hamilton of the Old Dominion Line, which was bound northward, telling of the wreck. The Hamilton stopped and took aboard the wreck victims who were conveyed to New York.



The Washingtonian

Vesssels Equipped With Marconi App aratus Since the February Issue

Names	Owners	Call Letters
Georgiana	Walker, Armstrong & Company	KJE
Owera	Congressman Peter Gerry	KZG
San Cristobal	Campania Mexicano de Patroleo Aguila	
Satsuma	Barber & Company	KJI
William O'Brien	East Coast Transportation Company	KPN
Craster Hall	Isthmian Steamship Line	KLK

THE SHARE MARKET

New York, December 24.

The market is sluggish and moderation in trading still prevails. This apathetic condition is due of course to the European war and a general tendency to wait for news of the results of the struggle. It is predicted, however, that the lack of activity in the market will be succeeded by briskness as the cautious spirit which was born with the war gradually gives way to normal confidence. The outlook for Marconis is cheerful and, in the opinion of brokers, they are more than holding their own, considering the state of the market.

Bid and asked prices to-day:

American, 2⅜—2¾; Canadian, 1¼—1½; English, common, 8—10½; English, preferred 7½—10.

The Institute of Rado Engineers

At the meeting of the Institute of Radio Engineers, held February 3, at Fayerweather Hall, Columbia University, New York, John Stone Stone delivered a presidential address and a paper on "The Effect of the Spark on the Oscillations of an Electrical Circuit." The paper described the theory of oscillating circuits having sources of both linear and logarithmic decrements within themselves. A highly novel and interesting application of the principles described was also presented for the first time.

The reading of the paper on "Wooden Lattice Masts," by Cyril F. Elwell, Chief Engineer of the Universal Radio Syndicate (Poulsen System) of England, postponed from the previous meeting of the Institute, followed Mr. Stone's paper and gave in detail the design, construction and guying of lattice masts.

SUES TO GAIN POSSESSION OF THE TUCKERTON STATION

The Compagnie Universelle de Telegraphie et Telephone Sans Fil, a French corporation, has instituted a suit in the New Jersey Court of Chancery to gain possession of the trans-Atlantic wireless station at Tuckerton, N. J., naming as defendants the Hoch-Frequenz-Maschinen Aktiengesellschaft fur Drahtlose Telegraphie, a Prussian corporation; Rudolph Goldschmidt, of Charlottenberg, Prussia, and the United States Service Corporation, a New Jersey company. In the bill of complaint, which was filed on February 15, it is stated that according to the terms of an agreement between the corporations the property and patents of the defendants, including the station at Tuckerton, N. J., were to have been placed in the hands of the complainant upon payment of a certain sum of money. The suit has been instituted for the purpose of compelling the carrying out of the agreement of sale.

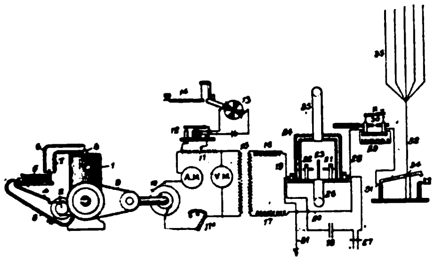
SERVICE ITEMS

Charles H. Taylor, engineer of the Trans-Oceanic Division of the Marconi Wireless Telegraph Company of America, has returned to New York after a two months' absence on a trip to Europe.

Arthur M. Greenwell, manager of the Marconi station at Astoria, Ore., became a benedict on December 5th. Miss Lillian F. Johnson, of Blind Slough, Ore., is his bride. They were married at the Methodist church parsonage, Astoria, Ore., the Rev. W. S. Gordon officiating. Mr. and Mrs. Greenwell will make their home in Astoria.

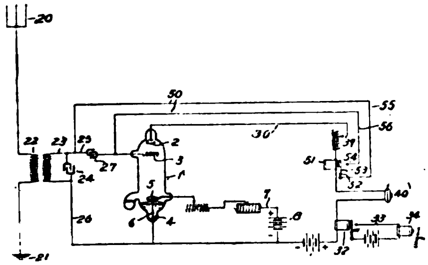
RECENT PATENTS

1,126,966. SENDING MECHANISM FOR ELECTROMAGNETIC WAVES. REGINALD A. FESSENDEN, Washington, D. C., assignor, by mesne assignments, to Samuel M. Kintner, Pittsburgh, Pa., and Halsey M. Barrett, Bloomfield, N. J., receivers. Filed Aug. 26, 1904. Serial No. 222,302. (Cl. 250—17.)



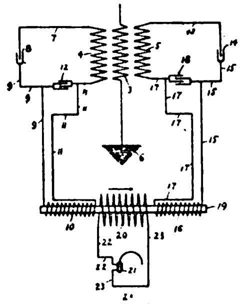
1. Apparatus for wireless telegraphy including a generator and transmitting apparatus, the latter including a typewriter and simultaneously operating code commutator, a resistance in the system, and a short circuit around the resistance, an electromagnetic circuit closer, for closing said circuit, and being controlled by said commutator.

1,127,371. APPARATUS FOR AMPLIFYING OR DETECTING ELECTRICAL VARIATIONS. GEORGE W. PIERCE, Cambridge, Mass. Filed Mar. 11, 1914. Serial No. 824,034. (Cl. 250—27.)



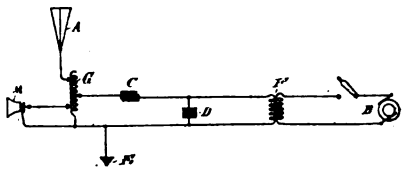
1. An apparatus for amplifying or detecting electrical variations having, in combination, means for maintaining a sensitive conducting gaseous space, a plurality of electrodes in the space, a controlled electric circuit including a source of electrical energy connected between two of the electrodes, a controlling electric circuit including a condenser connected to an electrode other than the controlled circuit electrodes, and means controlled by the current in the controlled circuit for shunting the condenser.

1,127,368. INTERFERENCE-PREVENTER. THOMAS BURTON MILLER, Seattle, Wash., assignor of one-half to Smith Cannery Machines Company, Seattle, Wash., a Corporation of Washington. Filed Jan. 6, 1913. Serial No. 740,385. (Cl. 250—8.)



1. In a receiving apparatus of a wireless telegraph station, the combination with a transformer having a primary helix adapted for connecting one of its terminals to the earth and its other terminal to the antenna of a wireless telegraph station and having two secondary helices, of two separate oscillating circuits each of which oscillating circuits includes one of said secondary helices, two detectors one of which is connected in each of said oscillating circuits in series with said secondary helix therein, a condenser connected in each of said oscillating circuits in series with said detector and said secondary helix therein, two primary helices each of which helices is connected with a different one of said oscillating circuits in parallel with the said condenser therein, a magnetizable core inductively and movably associated with both of said primary helices, a secondary helix movably and inductively associated with said magnetizable core and both of said primary helices and a translating device connected with said secondary helix.

1,125,496. WIRELESS-TELEPHONE TRANSMITTING SYSTEM. LEE DE FOREST, New York, N. Y., assignor to Radio Telephone & Telegraph Company, a Corporation of Delaware. Filed Sept. 17, 1910. Serial No. 582,449. (Cl. 250—6.)



1. A wireless telephone transmitting system, including a source of alternating current supply having a frequency below the upper audible limit, and a multiple spark gap, and means for modifying the radiated waves from such system by and in accordance with sound waves.

Marconi Men

The Gossip of the Divisions

Eastern Division

E. L. Martin has been assigned to the San Marcos, a one-man ship.

H. Q. Horneij is on the Satilla, bound for Europe.

J. A. Quinlan has been assigned to the newly-equipped oil boat Caloria.

C. L. Fagan and M. E. Fultz are making a trip across as senior and junior, respectively, on the City of Columbus, which is carrying a cargo of cotton to Holland and other countries.

M. H. Hammerly, who was detailed on the Santa Cruz for many months, is now on the Bantu.

W. V. Moore and Alex Bald have been transferred, Moore going to the Philadelphia and Bald to the Calabria.

Earl Thornton has been assigned to the reequipped Vesta.

M. O. Smith, who recently returned from the Pacific coast, is now senior on the Parima. J. E. Doyle of the Southern Division is his junior.

P. K. Trautwein is back on his old ship, the Cherokee, having been transferred with B. N. Lazarus, who is now on the El Dia. The Dia is making a trip across the Atlantic laden with cotton.

H. Orben has been appointed junior of the Kroonland, of which E. N. Pickerill is chief operator. The Kroonland is making an 80-day cruise around the coasts of North and South America, starting from New York and stopping at Havana. From the latter port she will head for the Panama Canal and, after passing through that body of water, will cruise down the coast before proceeding north to San Francisco and the Fair.

M. C. Tierney, who was temporarily assigned to the South Wellfleet Station, has resumed duty at Siasconset. A. R. Gardner has also been assigned to Siasconset, having been transferred from the Virginia Beach Station.

R. Poling and A. G. Berg have resumed duty as first and second operators, respectively, on the Esperanza, which recently went into commission.

Louis Michaels has returned to duty as senior on the Jamestown after two weeks' absence on sick leave.

A. H. Randow, who was the operator on the Washingtonian, which recently sank, has been assigned to the Dakotan.

J. A. Bossen has been assigned to the Nueces, a one-man ship.

G. H. Reachard of the Southern Division has been assigned to the widely-discussed Dacia.

D. J. Surrency and G. I. Martin have been assigned to the Commewijne as senior and junior, respectively, relieving Carl Plossl and V. Carrougher who, after a year's continuous service on that vessel, have been detailed to the Perfection and Hamilton, respectively.

G. P. Hamilton, after more than thirteen months of continuous service as first operator on the Cherokee, has been transferred to the Matura. A. B. Langenberg takes his place as senior on the Cherokee.

R. R. Schleckser has resigned from the service.

T. J. Goss, junior operator of the Stephano, has resigned from the service to enter the Signal Corps of the Canadian Army.

W. C. Thompson is again on duty after a short vacation, having been detailed as senior operator of the El Dia.

C. Heimline has been promoted to first operator and is now on the El Rio. M. A. C. Luedtke is second man.

A. S. Fraser, formerly junior on the Tennyson, has resigned and returned to England to enlist.

H. S. Williams has been assigned to the S. Y. Solgar, which has been placed in commission. The Solgar is controlled by the Canadian Company.

C. D. Riley is crossing the Atlantic on the Antilla.

E. K. Oxner is now on the Craster Hall, a newly-equipped Isthmian liner.

M. Beckerman, who served for almost two years on the Hamilton with his brother Ben, has been promoted and is now senior operator on the Jefferson. P. H. Nisley, of the Marconi School of Instruction, is junior.

William Miller, who was senior operator on the Obidense, which was recently wrecked off the coast of England, has been assigned temporarily to the Kanawha, an English vessel.

O. C. Temple has replaced F. Rosensweig on the Comet.

R. G. Cuthbert has succeeded L. H. Marshall on the Comal as senior operator. Marshall has resigned.

G. F. Hawkins, of the Brabant, who rendered excellent service when the steam yacht Wakiva was wrecked off the Tampico Breakwater, has been transferred to the Guantanamo. N. J. Ribler, formerly of the Guantanamo, is now on the Colorado.

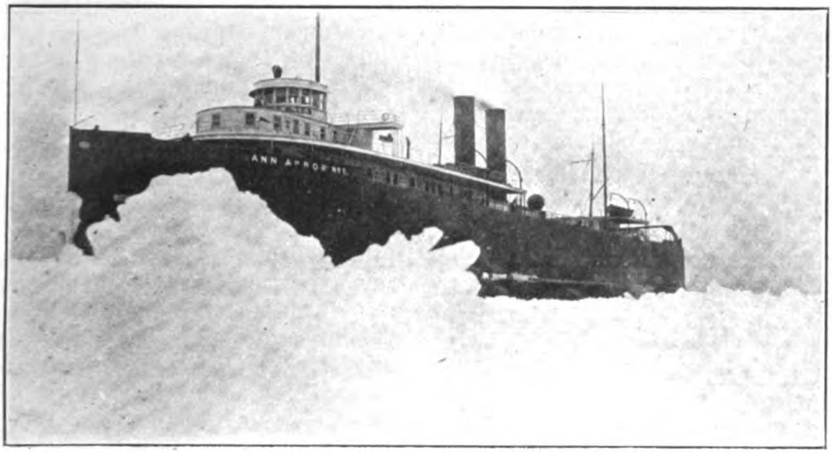
M. Hanover is now on the Brabant.

The inspection, maintenance and repair work in connection with all ship stations has been transferred from the Engineering to the Traffic Department. The Engineering Department will continue to have charge of the coast station equipments.

Great Lakes Division

H. H. Hoffman was recently placed in charge as purser-operator on steamer A. A. No. 3 during the absence of Ross Cutting.

It may be of some interest to Marconi men who have never had a detail on the Great Lakes to be told something of the difficulties of navigation on fresh water during the winter. During February, 1915, the steamers plying on Lake Michigan experienced more difficulties than in any month since 1902. These were due to the heavy snow storms and low temperature which caused the still water to freeze into one compact bed of slush ice. When the steamship George was caught in an ice-jam on February 4, sixteen other vessels were in a similar predicament at various points on the coast of Lake Michigan. The Marconi operators on these ships and the operators at the coast stations rendered valuable service in transmitting information regarding conditions on the ice-locked craft.



The steamship Ann Arbor imprisoned in the ice on Lake Michigan. In the background can be seen the mast and aerial of the steamship Georgia, also in the ice jam

Southern Division

Manager A. R. Gardner of the Virginia Beach station has been transferred to the Siasconset station, having been relieved by A. Y. Forrest, who has until recently been chief equipment tester at the Marconi factory at Aldene, N. J.

Junior Operator Grantlin of the Gloucester has resigned from the Marconi service and enlisted in the naval collier

service. Grantlin's vacancy has been filled by Junior Operator Murphy of the Merrimack. Otto Naber has been assigned to the Merrimack as junior operator in place of Murphy. Naber is a former Marconi man, having resigned from the service several months ago.

Operator Walter Neumann has recovered from a severe case of pneumonia, and is now ready to "hit the wet trail" again.

Junior Operator E. McCauley has been transferred from the Ontario to the Somerset, relieving Junior Operator H. O'Day, who in turn relieved McCauley on the Ontario.

Operator F. Birch has been assigned to the Grecian as junior operator, in place of F. A. Lafferty, who was assigned to the Great Northern.

Assistant Operator L. W. Sinclair of the Jacksonville station was married recently. We extend our heartiest congratulations to Mr. and Mrs. Sinclair.

Installer Murray is pushing the amperes in a lively fashion on the reinstallation of the Jefferson, of the Old Dominion Line, at Newport News.

Pacific Coast Division

The Aztec of the Pacific Mail Steamship Company has departed from San Francisco for South America by way of Central America with Operator R. J. Phair, in charge. Phair has been on sick leave since November 24, 1914.

Operators R. H. Brower and E. C. Nelson, first and second, respectively, on the Admiral Farragut of the Pacific-Alaska Steamship Company have completed a year's good service on that vessel.

B. C. Springer and I. W. Hubbard have been assigned to the Admiral Dewey. After a five or six months' run into the hot regions (Panama), the change is very agreeable.

E. S. Clark, formerly of the Oleum, has been transferred to Barge 95, bound for the East Coast.

H. Oxsen, who has been on a vacation since December 7th, 1914, has been assigned to the Balboa. The Balboa is one of the new equipments for the Southern trade. Her cruise is expected to cover a period of about six months.

Operators M. L. Bergin and A. L. Cresse, first and second, respectively, on the Camino, have been highly commended for the operation of their wireless apparatus when the Camino was disabled off the Newfoundland coast. The following extracts from newspapers tell of the accident:

"Halifax, Jan. 17th. Wireless calls for aid from the American steamship Camino, carrying supplies for Belgian refugees, were picked up here to-day. With her rudder torn away, the Camino is helpless in a severe storm, 150 miles southeast of Sable Island in the North Atlantic, and 270 miles from Halifax. Captain Ahlins, in a wireless message, reports that the vessel's deck house has been carried away, but makes no mention of any loss of life. The Canadian Government steamer Lady Laurier and other vessels are speeding to her assistance. The Camino has a crew of 30 and 1 passenger."

"Halifax, Jan. 22nd. A terrific battle against wind and sea is being waged today by the steamers attempting to bring the disabled American steamer Camino into Halifax. A wireless dispatch received here says that the hawser again parted and the Camino fell back in the trough of the sea. The ship is still 300 miles from Halifax."

Other reports regarding the accident are to the effect that the wireless cabin was torn from its lashings. The operators, as the weather permitted, assembled the apparatus in a corner and flashed further signals, keeping in constant touch with other stations.

E. Diamond, formerly of the General Hubbard, has been assigned to the Carlos.

P. M. Proudfoot has joined the Centralia, which is on the passenger and freight run between San Francisco and Eureka.

J. A. Marriott and D. R. Clemons are once more on the liner Congress.

A. C. Forbes and C. Bentley recently arrived here on the China. The newspaper sales on that vessel shattered all previous records.

S. P. Smith, who came from the Atlantic Coast in charge of the plant aboard

the Francis Hanify, has been transferred to the California. On February 7 she was reported 1,972 miles south of San Francisco, bound for Galveston.

W. R. Lindsay has been assigned to the Colon. This vessel was wrecked off the coast of lower California on February 5th, during a heavy storm. Lindsay's call for help was answered by two of the United States cruisers in that vicinity. All the passengers and crew were safely taken off.

L. O. Marsteller and N. J. Marthaler have been acting as first and second aboard the City of Topeka since February 1st.

P. C. Millard was assigned to the Col. E. L. Drake.

E. O. Mohl, after a stay of one year and nine months aboard the Hyades has been transferred to the Enterprise.

W. H. Stevenson has been detailed on the Francis Hanify. This vessel is now in the service of the Matson Navigation Company, plying between San Francisco, San Pedro and Honolulu. On her initial trip reports were received nightly until she arrived at Honolulu.

J. A. Falke has been transferred from the "sick squad" to the Governor. Falke has been ill from typhoid fever.

A. F. Pendleton, formerly on this Coast, arrived here recently on the Honolulan from New York.

C. F. Fitzpatrick has been assigned to the Hyades.

D. M. Taylor has relieved L. T. Franklin, as assistant, on the Korea.

W. J. Erich and L. T. Franklin have been assigned as first and second, respectively, to the Lurline.

B. McLean, first, and E. S. Howard, assistant, on the Mongolia, have captured the message toll record for the Pacific Coast, and expect to hold it against all comers.

R. F. Harvey has been assigned as first operator of the Multnomah. R. Baer is assistant.

G. S. Bennett has been transferred to the Matsonia, as assistant. E. T. Jorgensen is senior operator.

F. W. Shaw, temporarily assigned in charge aboard the Manoa, became seriously ill two days before the arrival of that vessel at Honolulu. Shaw, after spending a few days at the local hospital, enjoyed a short vacation at the Kahuku Station, while waiting for the Wilhelmina to take him to San Francisco.

The Manoa left Honolulu on February 2nd with Operators J. A. Miche in charge, and R. E. Hageman as assistant. Hageman is returning to Honolulu as assistant on the Wilhelmina. This is Hageman's second visit to San Francisco as emergency man. During November, 1913, he replaced Operator Gawthorne on the Ventura for the trip to San Francisco and return to Honolulu.

E. Smith, assistant on the Wilhelmina, has been transferred to the same position aboard the Manoa.

J. E. Dickerson, formerly of the Mazatlan, has been assigned to the Navajo, sailing from San Pedro to Bremen.

F. W. Brown, formerly assistant on the Sonoma, has been transferred to the Peru. G. H. Harvey is in charge.

C. E. McNess has been detailed as operator in charge of the President. N. McGovern has been assigned as assistant.

A. Konigstein has been assigned as operator in charge of the General Y. Pesqueira, bound for Central and South America.

C. P. Williams has relieved J. L. Barttro as assistant aboard the Queen.

F. Mousley has joined the Rose City as first operator. T. Lambert is acting as assistant.

C. Trostle, formerly of the Whittier, has been transferred to the Stanley Dollar.

N. D. Talbot and J. Hauselt have left for Panama, as first and second, respectively, of the San Juan.

B. R. Jones and F. Camenisch have been assigned as first and second, respectively, of the Speedwell.

C. A. Peregrine has been transferred to the Santa Clara as assistant.

L. W. Sturdivant has been assigned to the Santa Cruz for the trip from New York to San Francisco, thence to Alaska for the packing season.

J. F. McQuaid, of the Santa Cecilia, and H. W. Sinclair, of the Santa Clara, of the Grace Line, have recently been transferred to the Pacific Coast Division.

San Francisco High Power Station Items

"Slim" Bartlett, who was with us since opening day, has departed for "warmer climes," having been transferred to the staff at Kahuku, Oahu. "Slim" showed a dash of speed when notified at noon that he was to leave at four P. M. Shortly before his departure, Bartlett defeated Pratt of Bolinas in a closely contested game of chess, which was played over the local wire. One move was made daily for a week, the game being finished on Sunday.

H. B. Segur of the Klamath is now holding down the day trick.

A. E. Gerhard is still grabbing the "CLT" business from the air on the night trick, and is well satisfied with the strength of night signals.

Prior to the closing of the duck season several members of the staff tried their luck at shooting. After several cruises about the bay before daylight it was explained that "key pushing" was detrimental to a trigger finger.

We were visited on February 1 and 8 by severe storms during which the wind reached a velocity of eighty miles an hour. This caused some slight delay to operation. Our fuel oil storage tank, which was buried in the ground, floated out of its position during the heavy rain, and, with one end in the air, took on the appearance of an aeroplane gun.

Seattle Staff Changes

Fred Wilhelm temporarily relieved J. A. Marriott on the Congress for one voyage, while Marriott took charge of first trick at the Seattle station.

W. R. Blanchard, A. Brown and G. C. McCarty have resigned.

J. E. Johnson and A. E. Marr have been assigned to the Admiral Watson.

A. Lang and W. Chamberlain are on the Admiral Evans.

Fred Wilhelm and C. F. Trevatt have been detailed to the Minnesota.

R. Ticknor and A. Gail Simpson are now first and second, respectively, on the City of Seattle.

P. C. Millard has been transferred to the Southern District on the Col. E. L. Drake.

W. J. Manahan, formerly a member of the San Francisco Construction Department, has taken up his duties in the Seattle Construction Department. He has just returned from a trip to Bellingham, where he equipped the A. G. Lindsay, which has been renamed the Pavlof. M. A. Obradovic has been assigned to the Pavlof.

ICE-BREAKER FOR RUSSIA

The steel steamer Lintrose, which was built for the Reid Newfoundland Company in 1913, has been purchased by the Russian government for service as an ice-breaker in the White Sea. The vessel will replace the Canadian government ice-breaker Earl Grey, which is said to be frozen in at Archangel.

The Lintrose and her sister ship, the Kyle, have been running between Port aux Basques, at the southwest extremity of Newfoundland and North Sydney, Cape Breton, carrying passengers and freight. The Lintrose has shown that she is able to plough through the ice of Cabot Straits and make nightly trips throughout the winter months. She carries a wireless equipment of 1½ k.w. power which was installed by the Marconi Wireless Telegraph Company of Canada, Limited. Wireless telegraphy will prove of great advantage to the vessel in her capacity of ice-breaker, enabling her to keep in communication with other vessels engaged in similar service and the port of Archangel.

OPERATOR DODD ON THE ILL-FATED PATROL

Among those who were on the British government patrol boat Char when she was recently sunk in collision with the steamship Erewan was John Dodd, wireless operator. Dodd, who was thirty years old, joined the Navy soon after war was declared. For a time he was detailed on the Irresistible, but was later transferred to the Char. The Char was steaming toward the Erewan to search for contraband of war when she ran afoul of the latter's bow and was sunk.

Little Ideas Bring Great Results

MARCONI AND THE WIRELESS TELEGRAPH

From the San Francisco Chronicle.

IT was near St. Johns, Newfoundland, in a room in an old barracks building, on December 12, 1901, that Guglielmo Marconi demonstrated to his own satisfaction that a project in which he had been long engaged had been accomplished. On the table in front of him he had placed a mechanical apparatus, and by his side was an ordinary telephone receiver. The window near which he sat had been left partly open, and a wire led from the machine on the table through the window to a gigantic kite that a high wind kept flying fully 400 feet above the room.

When conditions became such that Marconi believed that he would be able to obtain some convincing evidence of success, he placed the receiver to his ear. He sat silently for a long time. He showed no evidence of excitement, though an assistant, who stood near him, was visibly nervous.

Suddenly there came a sharp click of the "tapper" as it struck the "coherer." That meant that something was coming. Marconi listened for a few minutes and then handed the receiver to his assistant. "See if you can hear anything, Mr. Kemp," he said. The other man took the receiver, and in a moment his ear caught the sound of a few little clicks, faint, but distinct and unmistakable, the three dots of the letter S of the Morse Code.

These clicks had been sent from Poldhu, on the Cornish coast of England, and they had traveled through the air across the wide expanse of the Atlantic. This was one of the great moments of history. Marconi was the first man to realize what other men had imagined for many years. Even Edison, the electric wizard, had, for a time, worked on the problem of wireless telegraphy, but Marconi devised the last link that made the wonder possible, and it was this Italian who caught the first click that came across the ocean.

Judge Townsend, in deciding a suit in the United States Court in 1905, declared: "It would seem, therefore, to be a sufficient answer to the attempt to belittle Marconi's great invention that, with the whole scientific world awakened by the disclosures of Hertz in 1887 to the new and undeveloped possibilities of electric waves, nine years elapsed without a single practical or commercially successful result, and Marconi was the first to describe and the first to receive the transmission of definite intelligible signals by means of these Hertzian waves."

As early as 1844 Samuel F. B. Morse had succeeded in telegraphing without wires under the Susquehanna river, and in 1854 James Bowman Lindsay, a Scotchman, had sent a message a distance of two miles through water without wires. Sir William Henry Preece, by using an induced current, had telegraphed several miles without a connecting wire. But the discoveries made in regard to the Hertzian waves placed the subject on a different footing, and the possibility of an actual usable wireless telegraph was now looked at from a new viewpoint.

On January 19, 1903, President Roosevelt sent the first "official" wireless message across the Atlantic to King Edward VII, and in October, 1905, a message was sent from England across the mountains, valleys and cities of Europe to the battle-ship Renown, stationed at the entrance of the Suez canal.

There is apparently no limit to the future possibilities of the wireless. Wireless storm warnings and general weather forecasts for ships at sea, covering conditions 100 miles off shore along the entire Atlantic Coast, were inaugurated by the United States Navy Department on July 15, 1913. Direct wireless communication between America and Asia was established by the completion of stations in Siberia and Alaska, the stations being about 500 miles apart. Today no vessel of any consequence plies the oceans without its system of wireless, and its effectiveness in receiving news of the present European war is well known.

Queries Answered

Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of an individual can be answered. To receive attention these rules must be rigidly observed.

Positively no Questions Answered by Mail

G. P., Omaha, Neb., writes:

Ques.—(1) My aerial is 25 feet in height, 65 feet in length and consists of four wires on a 6-foot spreader with a lead-in 25 feet in length. Please tell me the wave-length and also what it would be if the aerial were 12 feet higher.

Ans.—(1) About 145 meters.

Ques.—(2) Please tell me my receiving range, day and night, with the following instruments: 2-slide tuner, 13 inches in length and 5½ inches in diameter wound with No. 19 enameled wire; navy type inductive tuner as described in the November, 1913, Modern Electrics; Murdock condenser, silicon and galena detectors; 75-ohm receiver and 2,000-ohm receiver.

Ans.—(2) Daylight range 100 miles; night range doubtful; depends upon the station you desire to receive from. You might possibly hear Arlington in the winter time at night. The actual receiving range depends upon the local conditions surrounding your station.

Ques.—(3) What time is it in Omaha when Arlington sends the time at night?

Ans.—(3) One hour earlier at Omaha. When it is 10 P. M. at Arlington, it is 9 P. M. at Omaha, standard time.

* * *

J. A. M., Milford, Utah, writes:

Ques.—(1) Describe the auto-transformer and give the number of the patent covering, used by the DeForest people in their one, two and three-step amplifiers.

Ans.—(1) We have no record showing that patents have been allowed on the one, two or three-step amplifiers.

Ques.—(2) Give the length of the shortest one-wire aerial 50 feet in height that can be successfully loaded to 16,000 meters. What is the shortest wave-length the same aerial would respond to with condenser in series?

Ans.—(2) The wire should be at least 1,000 feet in length. You cannot reduce the wave-length of an antenna to more than one-half its natural wave-length. It simply means cutting the aerial off from the earth connection. To adapt an antenna suitable for the reception of 16,000 meters down to 300 or 600 meter waves is totally out of the question. Better results will be obtained at 16,000 meter wave-lengths if the length of the antenna is increased to 2,000 feet.

Ques.—(3) What are the maximum and minimum wave-lengths of the secondary and primary of the "loose-couplers" referred to in your answer to my inquiries in the December issue? How many turns of wire are needed on each coil and what is the best arrangement of taps?

Ans.—(3) The minimum wave-length to which this tuner will respond depends upon the number of taps you take off the windings. This should be self-evident. For instance, you might take a great number of taps from the windings giving a minimum value of inductance so as to allow wave-length adjustments down to 100 meters. You can arrange the taps to suit yourself, but a tuner responsive to 16,000 meters is not the proper piece of apparatus for receiving shorter wave-lengths. Even though you employ dead-end switches and cut off the unused turns, still you have not wholly eliminated the energy absorption of the unused turns, which should be entirely removed from the used turns for the maximum degree of efficiency. The data we gave you in the December issue was for a tuner to be used on wave-lengths from 7,500 up to 16,000 meters. It was not intended that it should be used on wave-lengths below 7,500 meters.

Ques.—(4) Is a rotary receiving transformer as efficient as a "loose-coupler" and what would be the dimensions, size of wire and number of turns on secondary and primary of a rotary to be equivalent to the "loose-couplers" referred to above?

Ans.—(4) This question is rather ambiguous. It would depend largely upon the design of the rotary receiving transformer. A rotary transformer for waves from 7,000 to 16,000 meters would necessarily have multiple layers, which would make it very inefficient. We advise you to hold to the ordinary designs, making your primary and secondary windings of a single layer on tubes as suggested. We have no data on a rotary tuner covering this range of wave-lengths.

Your fifth question is a repetition. The data for the windings given you in the December issue is quite sufficient for your needs. If you intend to employ this tuner with a valve detector, however, there is no harm in making the secondary winding of No. 36 wire. A design of this description gives a maximum value of voltage which is a desirable thing in connection with this detector. If you make the winding of No. 36 wire for a given wave-

length, the coil will be of decreased dimensions as compared with the coil wound with No. 30 or No. 32 wire.

* * *

F. M., Red Bank, N. J.:

Regarding your first query: The audion should work with or without a fixed condenser in series with the grid. If a fixed condenser is employed it should be one of very small capacity, not one of more than 0.0001 Mfds. Please observe that when the fixed condenser is removed from the circuit the wave-length of the secondary circuit of the receiving transformer is changed. For this reason stations which were received on certain adjustments with a fixed condenser in the circuit may disappear when the fixed condenser is cut out. There are certain circuits where best results are secured with a fixed condenser in series with the grid, but with an ordinary amateur tuner they are obtained in the majority of cases without the use of this condenser.

Regarding your second query: Why don't you try the secondary winding of your induction coil without having it measured? As stated many times previously in this department, it is not the resistance but the inductance value of the coil which counts. Because of the particular type of winding employed, however, the inductance value cannot be secured without having a considerable value of resistance. Undoubtedly the secondary winding of an 8-inch spark coil is quite sufficient for use as a one-to-one transformer.

* * *

C. P., Milton, Pa., writes:

Ques.—(1) Where can tantalum wire like that used in audion bulbs be obtained? I want to carry on some experiments with the audion, for which I will need some tantalum wire. I have means at hand for sealing and exhausting bulbs.

Ans.—(1) This wire may be purchased from Eimer & Amend, 205 Third Avenue, New York City.

Ques.—(2) Does the filament have to be tantalum? Why couldn't it be carbon or tungsten? Could it be replaced by a sun glass focused on wing and grid for experimental purposes only?

Ans.—(2) The filament is preferably of tantalum. Some results may be obtained from carbon and tungsten, but they will not be equal to those obtained with the tantalum filament. We can see no connection between a "sun glass" and a filament in vacua giving off electrons.

Ques.—(3) Does it matter what the wing and grid are made of? What is the usual distance from filament to grid and from grid to wing?

Ans.—(3) The wing and grid should both be made of nickel. Some fair results have been obtained when the wing is made of iron. The distance between the wing, grid and filament should be as small as possible, care being taken to keep the filament far enough distant from the grid so as to prevent it from curling up and effecting a short circuit.

* * *

H. B. W., Chanute, Kans., asks:

Ques.—(1) Where can I obtain information explaining in detail how to make an amplifier for boosting weak signals?

Ans.—(1) See the article on "How To Conduct a Radio Club" in the January, 1914, issue of The Wireless Age.

Ques.—(2) I am using a Murdock oscillation transformer No. 423 (sending helix) in connection with a ½ k.w. transformer, using "loose-coupling" as it is supposed to be used. I have not been able when using this coupling to be heard out of town. Using close coupling (the secondary only) I have been heard in Ohio; yet my friends argue that "loose-coupling" will give the best long distance results. Are they right, and how should I use this helix to get the maximum long distance?

Ans.—(2) We suggest that you study carefully the principles of resonance and coupling and get a clear understanding of these terms. With a given transmitting set, provided both the spark gap and aerial circuits are in resonance, there is some degree of coupling which will give the maximum value of current in the antenna circuit. The proper value is ascertained by experiment. Perhaps when you employed a low value of coupling the current in the antenna circuit dropped to such an amount as to reduce the effective range. But when you tightened the coupling, even though the set emitted two wave-lengths, the energy in one of these waves was of greater intensity than on the single wave-length when employing a loose coupling. Previous issues of The Wireless Age have contained full instructions for tuning a wireless telegraph set to resonance. Your friends are in the main quite correct in their statements and if you can adjust your set so as to radiate a good amount of energy on a single wave-length it should cover a greater distance than if the energy were split up between two widely separated wave-lengths.

Ques.—(3) Would the shock from the secondary of a ½ k.w. transformer giving a secondary voltage of 13,200 and operating on 110 volts A. C., 60 cycles, kill a man or just give him a severe shock.

Ans.—(3) While it might not be fatal, we advise you not to try the experiment.

Ques.—(4) Suppose an operator is waiting to receive a station sending on a known wave-length, for example, say 600 meters. Has there been any practical instrument developed to utilize the energy of the incoming signals to deflect a needle or to give other visible warning that a certain station is calling?

Ans.—(4) Call bell apparatus has never been developed to a high degree of efficiency and even if it were, the apparatus would be of little practical value, for the bell would ring every time an impulse of static discharged to earth through the antenna circuit. It is possible to "rig up" a polarized relay in the local circuit of an audion or to use the Brown

Amplifying Relays (referred to in previous issues of The Wireless Age) in a step-up manner to manipulate recording or signalling apparatus. Again you may use a valve amplifier with a loud speaking telephone enabling the signals to be heard across the room. You will find all apparatus of this nature very expensive and generally beyond tht means of the amateur experimenter. It is not well to delve into this phase of wireless telegraphy until you are thoroughly familiar with the fundamentals and have had considerable experience in a practical way.

Ques.—(5) I desire to obtain a complete knowledge of wireless, both from a practical operating standpoint and from a theoretical standpoint. I cannot spare the time to attend a school devoted to wireless. Would you advise me to buy books on the subject or to take a correspondence course.

Ans.—(5) We advise you to purchase books on the subject. We suggest the "Textbook on Wireless Telegraphy" by Rupert Stanley, "The Naval Manual of Wireless Telegraphy for 1913" by Commander Robison. Get into communication with the Book Department of the Marconi Publishing Corporation, 450 Fourth Avenue, New York City, and obtain a list of the books on Wireless Telegraphy which it sells. There are no correspondence courses given in wireless telegraphy and even if there were they would be of little value for a commercial wireless education unless they were written by someone with considerable practical experience. The first-named book in our answer to your query is the most up-to-date publication on the subject that we know of.

* * *

T. O'H., Jr., Chinook, Mont.:

The information in your query relative to the wave-length of certain aerials is not sufficient for calculation. We must have the height of the flat top portion from the earth as well as the length of the rat tails. The first aerial you suggest has a wave-length of about 300 meters; the second, about 325 meters, and the third about 400 meters. These are rough calculations.

* * *

H. F. W., Montpelier, Vt., asks:

Ques.—(1) Is a large (4,500 meter) "loose-coupler" more efficient for receiving long wave-lengths than a small (1,000 meter) coupler with loading coil, and vice versa?

Ans.—(1) An intelligent reply to this query would demand that we know the range of wave-lengths you desire to receive or the stations you expect to hear. Certainly a tuner built for 4,500 meters is more suited to the reception of longer wave-lengths than one having a range of 1,000 meters. This matter has been pretty well discussed in the Queries Answered Department and other articles appearing in The Wireless Age. It is well to build two tuners at any receiving station, one for the longer range of wave-lengths, say 4,000 to 10,000 meters, and the other for the shorter range of wave-lengths, covering from 300 to 4,000 meters.

Ques.—(2) Has New York (WSL) been transmitting on a 4,800-meter wave for the past week?

Ans.—(2) Yes; this station works nightly on a regular schedule.

Ques.—(3) Please tell me which is the more efficient tuning arrangement with a navy type coupler; should the variable condenser be connected in series or in parallel with the primary winding?

Ans.—(3) Generally the maximum strength of signals is received with the variable condenser of the receiver in series with the antenna rather than in shunt to the primary winding.

Ques.—(4) Are the stations at Belmar and New Brunswick, N. J., in operation now, and if so, on what time schedule, wave-length and spark system?

Ans.—(4) These stations are not quite completed and are therefore not in operation. The corresponding stations in England have been temporarily taken over by the British Admiralty and for this reason commercial work has not begun.

* * *

C. O. S., Frankfort, Mich.:

We have no data on a transformer as you request. We do not know the wave-lengths of the station of the Illinois Watch Company and we cannot advise concerning the mysterious station sending out CQ's.

* * *

H. M. W., Glen Roy, Pa.:

We have taken note of your sketch and advise that you remove the condenser in shunt to the spark gap. You will secure far better results with a coil of this type by simply connecting the spark gap in series with the antenna circuit. If the spark note is not clear, use smaller electrodes. They should not be more than 3/16 of an inch in diameter at the most. The set should certainly carry four miles unless local conditions prevent. The condenser connected across the spark gap as shown has no value and simply diverts energy which otherwise would radiate into space.

Ques.—(2) How would you fix a mechanical interrupter on the same shaft as a small rotary gap so as to make the interruptions synchronous to the spark frequency at the gap?

Ans.—(2) A description of a mechanical converter appeared on page 667 of the May, 1914, issue of The Wireless Age.

Ques.—(3) Would the gap referred to increase my range? If not, what would without using a larger coil?

Ans.—(3) We have found this mechanical converter to be rather unsatisfactory, requiring very careful adjustment and constant attention to produce results.

Ques.—(4) A coil rated at one-inch gave, when new, a one-inch spark on 6 dry cells, but now after 6 months of very intermittent usage, will give only a ½-spark on a 6-volt storage battery. Why is this?

Ans.—(4) We are inclined to believe that the capacity of the storage cell is below normal and is not furnishing a sufficient number of amperes to operate the coil. It may be that a portion of the secondary winding of the coil

has become short-circuited, but it is more likely that the plates in the storage cell have given out.

* * *

E. L., Independence, Kans., writes:

Ques.—(1) I have an aerial 700 feet in length and 80 feet in height consisting of 6 wires (phosphor bronze 7-22) spaced 14 feet. The earth connection is made to a 6-inch gas main and galvanized sheet iron plate 4 feet by 64 feet for a ground connection; no trees or telephone and electric light wires. With these conditions and a vacuum valve receiving cabinet and 3-step amplifier, what distances or stations should I be able to receive from? Can tune to about 12,000 meters.

Ans.—(1) If there are no local obstructions and the conditions surrounding your station are ideal for receiving you should be able to hear the Marconi high power station at San Francisco, Sayville, L. I., Cape Cod on the Atlantic Coast, and the New Brunswick station as soon as it is in operation.

Ques.—(2) Should a lead-in wire from the aerial referred to come from the center or should a lead be taken from the end?

Ans.—(2) It should be taken off from the end.

Ques.—(3) I am going to put up a small aerial for sending. How near the other aerial should this one be for a pure and sharp wave? Should it be at right angles to the other?

Ans.—(3) To say the least, the small aerial should be placed at some distance from the large aerial. It need not be necessarily at right angles, but if it can be so placed conveniently it should be done.

Ques.—(4) Is it possible to purchase a Pickard telephone head set?

Ans.—(4) Yes; communicate with the Wireless Specialty Apparatus Company, 81 New Street, New York City.

Ques.—(5) With a Clapp-Eastham 1 k.w. "hytone" transmitter what distance should be obtained using a 200 meter wave?

Ans.—(5) Forty miles.

* * *

W. H. S., Ardmore, Pa., writes:

Ques.—(1) It seems to me that the transmitting condenser is a bugbear similar to the detector. The evils caused by leaky condensers are too well known to you to mention. As I understand it, the ordinary glass plate paraffin condenser is notoriously inefficient, and the oil not much better. I am at the present time using a Murdock moulded condenser which seems O. K. The trouble I experience with condensers is that as soon as I regulate the speed of the gap to synchronism they have a habit of puncturing every few days—sometimes with a non-synchronous spark. (Transformer ¼ k.w.; secondary voltage 13,200.) Of course you sav use two banks in series, but figuring on 0.0017 Mfds. capacity per section, what would it cost for a 200 to 250 meter wave at $2.00 per section?

Ans.—(1) You should use a series parallel connection of the Murdock condensers. You require a capacity value of about 0.01 Mfds. Six sections in parallel will give this capacity. But if you use a series parallel connection you will require 24 of these units, 12 in parallel in each bank and the two banks connected in series. The condenser will therefore cost $48.00. Perhaps you may reduce the strain on this condenser by using the minimum possible length of spark gap. That is to say, have the electrodes of the disc move within 1/50 of an inch of your stationary electrodes.

Ques.—(2) "The Year Book of Wireless Telegraphy and Telephony" shows in some photographs what I believe to be compressed air condensers. I have been wondering what the capacity and price per section are and if they can be purchased by amateurs.

Ans.—(2) We are not aware that condensers of this type are described in "The Year Book of Wireless Telegraphy and Telephony." They are built by the National Electric Signal Company, Bush Terminals, Brooklyn, N. Y.

Ques.—(3) What is the price of the condenser tubes on your new Type E 120-cycle set and what about the brushing mentioned in the second paragraph on page 284 of the January, 1915, issue?

Ans.—(3) Communicate with the Traffic Department of the Marconi Wireless Telegraph Company of America, 233 Broadwav, New York City. Quotations on request. Condensers of all types are subject to brush discharge, the amount depending on the voltage applied.

* * *

L. S., Kingston, N. Y., asks:

Ques.—(1) Is there a wireless station at Mt. Beacon, N. Y.? If so, what are its call letters and what business does it transact?

Ans.—(1) The station formerly located at Mt. Beacon, N. Y., was dismantled several years ago.

Ques.—(2) Is the station at Sayville, L. I., working? If so, what time does it send and on what wave-length?

Ans.—(2) Yes; this station is working on a regular schedule every night at 15 minutes after nine o'clock. Its wave-length is 4,800 meters.

Ques.—(3) At what time during the day besides half past 4 o'clock in the afternoon do the two Wanamaker stations carry on communication?

Ans.—(3) Throughout the day at irregular intervals from half past 8 o'clock in the morning till half past 5 o'clock in the afternoon.

* * *

G. W., Berkelev, Cal., asks:

Ques.—(1) Is it better to have the stationary electrodes of a rotary spark gap opposite each other on different sides of the rotor, as on the Marconi disc discharger, or opposite each other on the same side as on the Halcun rotary? If it makes no difference, why did the Marconi Company adopt the former design?

Ans.—(1) It makes no difference; it is simply a matter of construction.

Ques.—(2) What effect would the use of two grounds of different lengths have on sharp tuning for either sending or receiving? Is such a ground desirable?

Ans.—(2) It will have no effect upon the tuning and will do no harm.

Ques.—(3) Is a vertical sending aerial efficient? Why?

Ans.—(3) The most efficient of all because there is a greater displacement current set up in the immediate space about the antenna and therefore a greater shock given to the surrounding ether.

Ques.—(4) Please tell me the natural period of a vertical aerial consisting of two wires 90 feet in height, the wire used being made up of 7 strands of No. 22 copper wire.

Ans.—(4) Approximately 124 meters.

* * *

G. T. A., Bayfield, Wis., writes:

Ques.—(1) I have a receiving aerial consisting of two wires 160 feet in length and 60 feet in height. Would the results from a 4-wire aerial be enough better to warrant the cost and trouble to put it up?

Ans.—(1) No; no particular advantage.

Ques.—(2) I am using a helix of 11 turns, 10 inches in diameter, and wish to make an oscillation transformer of it by making a secondary in the form of a ring to slide up and down on the outside for the coupling. How many turns should I use, and what size and kind of wire? This design is similar to the one used by the Marconi Company.

Ans.—(2) You may make the secondary winding of No. 4 D. B. R. C. stranded wire. It should have 4 or 5 turns wound closely together. We cannot advise whether your primary winding has the correct dimensions or not. We do not know the range of wave-lengths over which you desire to work or the size of the set with which it is to be used.

Ques.—(3) Should the primary be changed in any way?

Ans.—(3) A proper answer to this query depends upon the range of wave-lengths to be employed.

Ques.—(4) Why has Sayville shut down?

Ans.—(4) The station at Sayville has not closed. It may be heard on its regular schedule at nighttime on a longer wave-length—nearly 4,800 meters.

Ques.—(5) Please give me an explanation of the Arlington weather reports.

Ans.—(5) You may procure from the Weather Bureau, Department of Agriculture, Washington, D. C., a pamphlet fully explaining the time signals. A complete answer to this query also appeared in one of the 1914 issues of THE WIRELESS AGE.

* * *

E. E., Jr., Philadelphia, Pa.:

The following data is applicable for a ½ kw. open core transformer to operate on 60 cycles:

The primary core should be composed of No. 30 soft iron wire, 2¼ inches in diameter, which should then be covered with Empire cloth and wound with two layers of No. 12 D. C. C. wire for a distance of 14 inches. The secondary winding should have 10 pancakes, 7 inches in diameter, each 1¼ inches in thickness, wound with No. 32 single silk-covered wire. Each of these sections should be separated from the adjacent ones by insulating paper, ⅛ inch in thickness. There should be a micanite tube between the secondary and primary windings of a rubber tube of high insulating properties.

The condenser described in the November, 1913, issue of THE WIRELESS AGE should be sufficient for this transformer. The capacity of a suitable condenser should be about 0.01 Mfds. It may be made of 5 plates of glass, 14 inches by 14 inches, covered with foil, 12 inches by 12 inches, the plates to be connected in parallel.

* * *

C. F. O., Boston, Mass., gives us a problem in connection with a transmitting set which he himself admits will be inoperative. Briefly, he proposes to place two secondary windings, one on either side of the primary winding of the closed oscillatory circuit of a transmitter. He then erects an aerial in the loop form having two lead-ins, connecting one of these lead-ins to one of the secondary windings and the second lead-in to the other secondary winding. He informs us further that one of these secondary windings is wound in opposition to the other and therefore the energy from the closed oscillatory circuit of the transmitter will make a complete circuit of the loop antenna per alternation of current. He wishes to know if there is any advantage with this connection or if the circuit is inoperative, and, if so, the reasons therefor.

Ans.—(1) It is at once evident that the secondary windings of the oscillation transformer are short-circuited through the antenna and through the earth and therefore could not be placed in resonance with the primary winding. There could be no advantage in sending an oscillation around this loop, for the magnetic flux on one side of the loop will be in opposition to that on the other, and therefore there would be practically no radiation. The entire arrangement of circuits as proposed is inoperative.

C. F. O. then asks how the balancing aerial of the Marconi High Power Stations enables a given receiving station to work simultaneously with the sending station. He also inquires if there is a difference in the wave-lengths of the two.

Ans.—(2) As he is apparently not familiar with the use of the balancing aerial he should refer to previous issues of the Marconigraph or THE WIRELESS AGE for information on this subject. In the article on "How to Conduct a Radio Club" in the November, 1914, issue of THE WIRELESS AGE he will be able to obtain information regarding what a balancing aerial is intended for. In trans-Atlantic work the transmitting station is located 40 to 50 miles from the receiving station, wire lines connecting the two stations on both sides of the Atlantic. A receiving station on this side constantly receives from a corresponding transmitting station which is situated, let us say, in England. The transmitting station on this side constantly sends to a corresponding receiving station in England. The transmitting station in America does not interfere with the receiving station on this side; first, because the stations are from 30 to 50 miles apart; sec-

ond, on account of the difference in wave-lengths between the transmitting and receiving station; and third, what energy might leak into the receiving aerial on this side is destroyed by the energy picked up from the transmitting station on the balancing out aerial.

Our correspondent then wishes to know if it would not be possible to send out an ideal continuous wireless wave by a succession of overlapping condenser discharges taking place so rapidly that there would be no breaks practically between the successive discharges. He wishes to know if this would not be the solution of the "long-sought for" ideal continuous generator.

Ans.—(3) This method was first employed by Guglielmo Marconi himself and it has been patented and successfully employed in trans-Atlantic service. The results obtained are practically the some as those procured with the well-known high-frequency alternator and many problems encountered in the high-frequency alternator are by this method wholly eliminated.

C. F. O. also sends us a freakish hook-up of a transmitting set, asking us if it has any bearing on the previous question. We can see no value whatsoever in this arrangement of the transmitting circuits and the problem presented has not sufficient value to be discussed.

Another query is along the following lines: He wishes to know if atmospheric conditions change the tone of wireless signals and then he cites one instance when the signals of a certain naval station seemed to change their tone. We advise that the rising and falling note which he heard from this particular station was undoubtedly due to poor regulation of the spark gap, which, by the way, was of the quenched type. Continuous discharges of atmospheric electricity at the receiving station will often change slightly the note of the transmitting station. It perhaps may be accounted for by interaction between the frequencies of the transmitting station and the impulses set up by the station. Generally speaking, however, this is not true, atmospheric electricity having but little effect upon the note of the signals.

* * *

R. N. L., Woodlawn, N. Y.:

Generally speaking, the operation of a 10-inch Marconi coil in connection with 60-cycle alternating current will be found unsatisfactory. It is rather hard to advise as to the impedance to use, but we suggest that you make several trials. You do not require more than 3 plates for the condenser of the size you suggest. Any number of hook-ups for the valve and crystal detectors have appeared in preceding issues of THE WIRELESS AGE and we suggest that you note them.

* * *

G. E. W., San Francisco, Cal., asks:

Ques.—(1) I should like to know the locations, names and wave-lengths of the stations which have the following call letters: NFC, NFH, NFI, NEK, CKK, NFU and NFL. What do RR, MF and RRB mean?

Ans.—(1) NFC, U. S. S. Eagle; NEK, U. S. S. Delaware; NFU, U. S. S. Ranger. The remaining "N" calls have not been assigned. The signal which you seem to think is CKK is probably KKC, which is the steamship Chalmette of the Southern Pacific Line. The signal RR is the international acknowledgment of receipt and is equivalent to O. K. You must have made an error in reading the signals MF and RRB; they are not standard signals.

Ques.—(2) What wave-lengths do the government stations use for sending out the time signals, and what stations send these signals?

Ans.—(2) Arlington, 2,500 meters; Key West, 1,000 meters; New Orleans, 1,000 meters; North Head, 2,000 meters; Eureka, 1,400 meters; San Diego, 2,000 meters; Mare Island, 2,500 meters.

* * *

W. Q. R., Baltimore, Md., asks:

Ques.—(1) Would the connection of the ground wire to the radiator of the steam-heating system make a good wireless ground?

Ans.—(1) It is not the best method, particularly for transmitting, because if there is a considerable length of piping between your apparatus and the actual earth connection, severe inductive effects are apt to be experienced in the house wiring. It is best, if possible, to run a stout copper wire from the apparatus to the water piping system where it enters the building from the street. In this manner high resistance joints such as may be expected at the pipe connections are eliminated. If the length of pipe from the apparatus to the earth is not over 10 feet and the current is not required to pass through many joints, direct connection to the steam pipes may be sufficient for both transmitting and receiving. We believe, however, that the underwriters in the majority of cities demand that the wireless system be connected to the earth with as short a length of wire as possible, and furthermore that circuits through pipe joints be avoided.

Ques.—(2) The length of the ground wire from the aerial to the connection at the radiator is 6 feet. In winter weather would the heat from the radiator effect or injure the instruments in any manner?

Ans.—(2) If the instruments are placed directly over the radiator it may warp the wood or hard rubber portions of your apparatus, and it is therefore advisable to place the apparatus at one side of the radiator so that it is directly out of the path of the heat waves.

Ques.—(3) Can an oscillation transformer be used with a 1-inch spark-coil?

Ans.—(3) Generally speaking, it is found unsatisfactory, owing to the very small condenser capacity which may be used with a coil. Better results are generally obtained by connecting the earth to the aerial leads directly to the spark gap. The 3-inch spark coil is the minimum size that may be employed with the oscillation transformer for satisfactory results. We are aware that amateurs often use 1-inch spark coils in this manner, but we have invariably found that the antenna circuit and spark gap circuit were hopelessly out of resonance.

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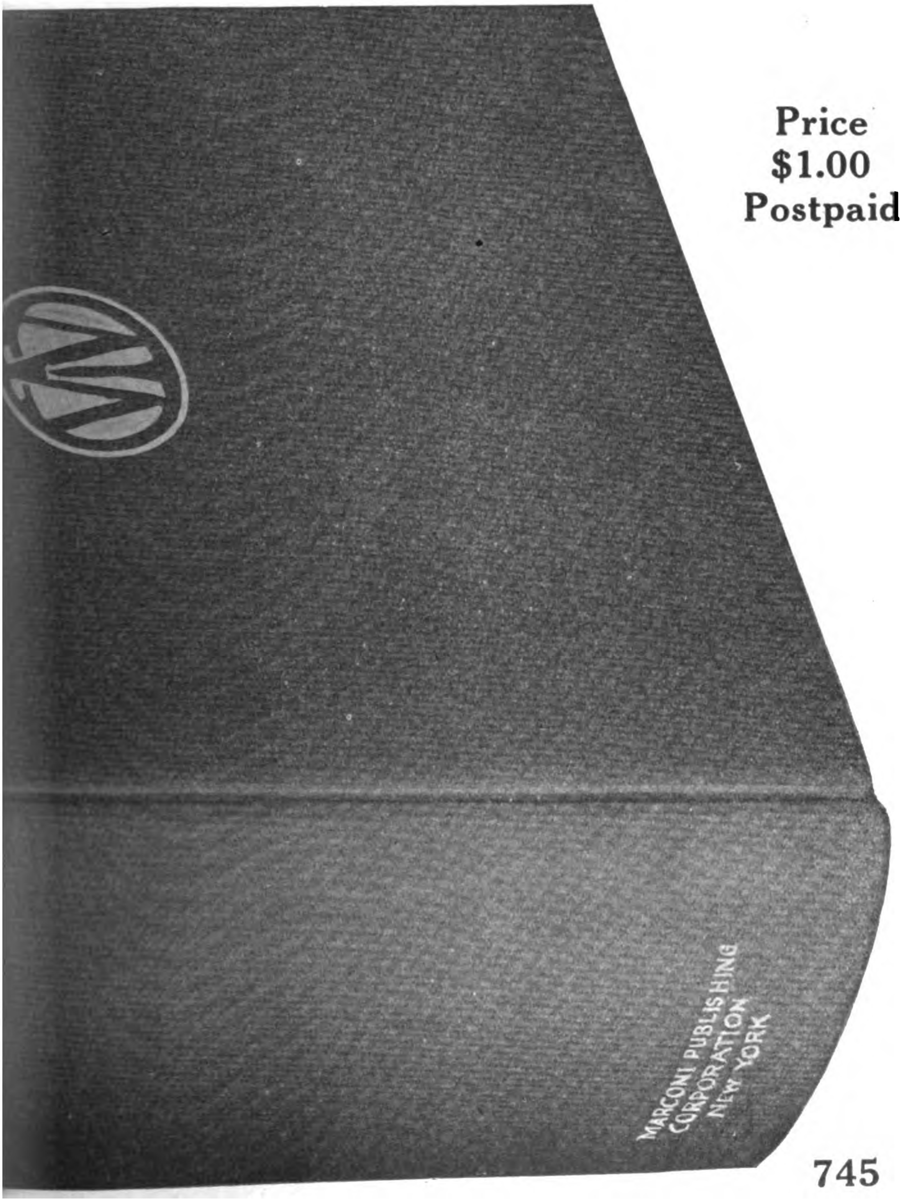

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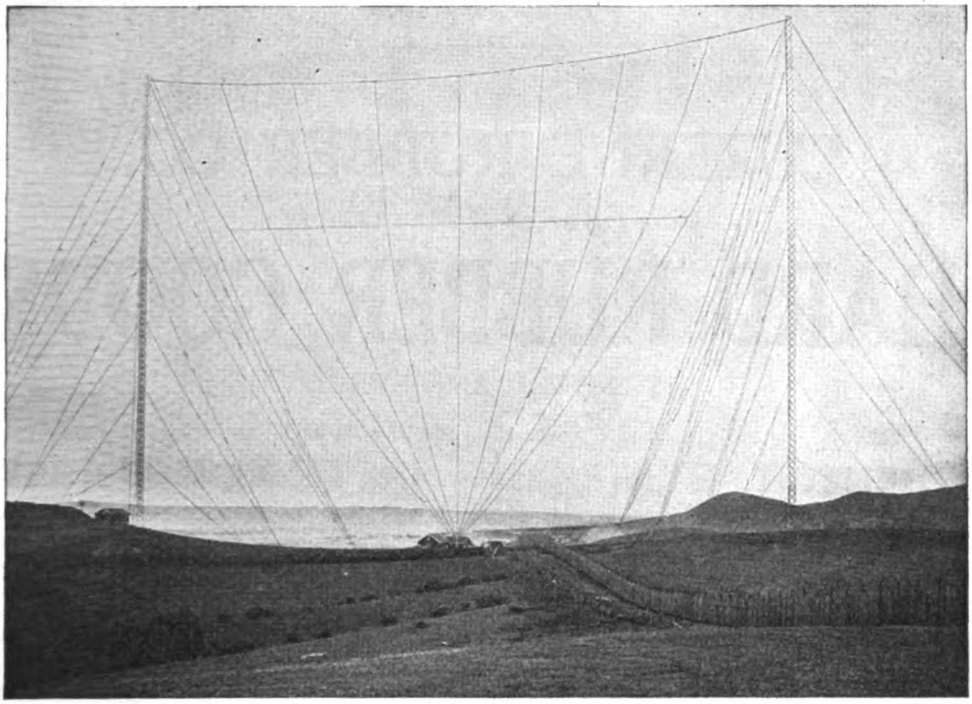

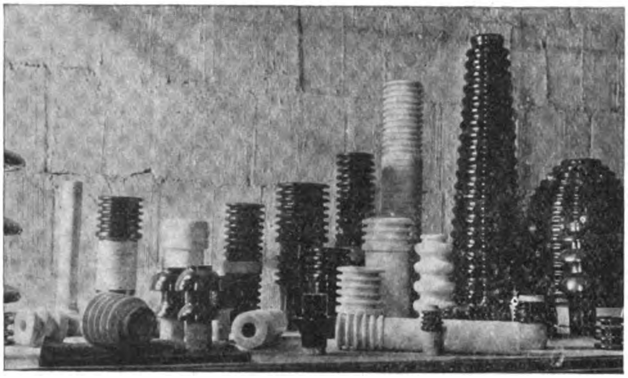

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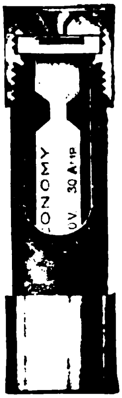

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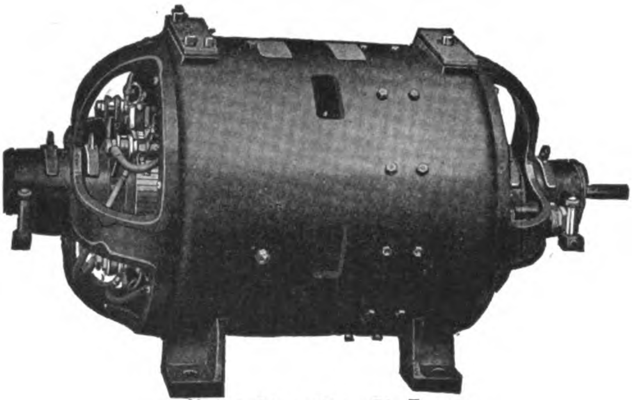

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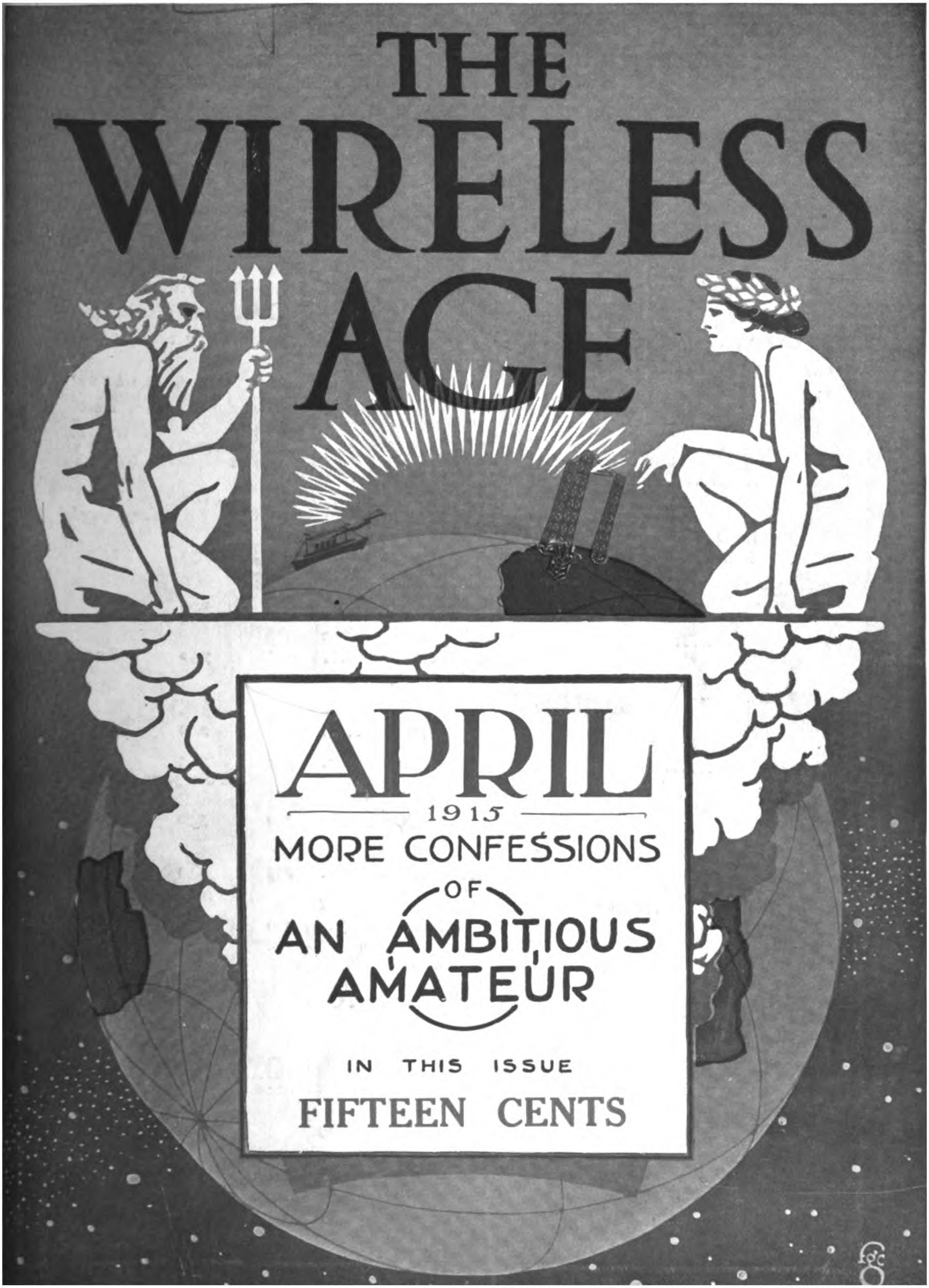
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An Illustrated Monthly Magazine of
RADIO COMMUNICATION

Incorporating the Marconigraph

J. ANDREW WHITE, Editor — WHEELER N. SOPER, Asst. Editor

Volume 2 (New Series) — **April, 1915** — **No. 7**

CONTENTS

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Entered as second class matter at the Post Office, New York

Here's a Letter—

or rather a part of a letter we found particularly interesting

Editor, THE WIRELESS AGE.

Dear Sir:—I received your letter about the renewal of my subscription to THE WIRELESS AGE. I am sorry to say that it was quite impossible for me to renew this subscription.

At the outbreak of the European war I was in charge of the wireless station on board the steamship Manchuria. On our arrival in Hong Kong, August 10th, I was detained and held as prisoner of war by the English authorities. Being out of work nearly five months, I am not able to pay for a new subscription, but my interest in THE WIRELESS AGE is so great I dare to beg you to renew my subscription without prepayment. After my release from here, which I hope will be soon, I am going back to San Francisco. Mr. —— will guarantee the amount of a yearly subscription which I am not able to pay right now. I hope that the fulfilment of my wish can be made possible.

Fritz Kleist,
Prisoner of War, c/o Provost Marshal, Hong Kong.

The letter needs little comment. Just as it stands, it is about as eloquent a testimonial to a reader's appreciation as could be made. Far off in a strange land, a prisoner of war, without money and facing an uncertain future he is pitifully anxious that he be not deprived of THE WIRELESS AGE. Needless to say, the request was granted.

Fritz Kleist will long be a pleasant memory in this office. Our main purpose in life is to please our readers, to make THE WIRELESS AGE *indispensable* to them. We have evidently succeeded in this case—and, we hope, in others we know nothing of.

THE WIRELESS AGE
450 Fourth Avenue, New York

THE WIRELESS AGE

APRIL, 1915

Railroad Club Discusses Wireless

"Train Dispatching by Wireless" was the title of the principal paper presented at the meeting of the New York Railroad Club held on February 19. L. B. Foley, superintendent of telegraph, telephone and wireless, Lackawanna Railroad, told of the practical demonstrations of value in his Marconi equipped system and predicted greater achievements for the near future.

Describing the equipment, Mr. Foley said:

"The wireless apparatus aboard the train is of one-kilowatt rating, and similar in principle and operation to that at our fixed stations. The motor generator on the train is operated on 30 volts direct current from the car-lighting generator, which carries on its line a set of storage cells. This motor generator draws about 40 amperes, and provides 500 cycle alternating current at 250 volts for the radio transmitter, including a 10-unit quenching gap, three glass-jar condensers of .002 microfarad each, and the usual radio frequency transformers. The antenna current is about 35 amperes. The train installation has not been inspected by the government as yet, and the call letters WHT and WBG are used temporarily.

"We can communicate from a moving train to a fixed station a distance of 130 miles. Owing to the low antenna on the passenger cars, we have not as yet been able to transmit a greater distance from the train, but are able to receive messages on the train from a fixed station a distance of 200 miles. On the train the aerial or antenna is formed of phosphor bronze wire arranged in four rectangles, one on the roof of each of the four forward cars lengthwise with an additional wire lengthwise, and all paralleled with the top of the car, each rectangle being carried on porcelain insulators at the corners and center of each car, with wire link connections between the cars. The wires clear the top of the cars about 18 inches, being low on account of bridges and overhead interferences; therefore the radiating power is limited. The lead is taken from the middle of the train antenna through the side of the car near the roof into a compartment two by four feet, which contains the wireless telegraph apparatus and the operator."

Among other interesting details Mr. Foley observed: "Commercial telegrams for passengers are handled. In one instance a telegram was filed by a passenger on the train for a resident in the city of Scranton, the message transmitted to destination, delivered, and the reply received by the sender in 20 minutes.

"On April 1 last year we ran a special train equipped with wireless telegraph from Ithaca to Hoboken carrying 550 Cornell students. Our train operator handled 128 radiograms from the train to fixed stations at Binghamton, Scranton and Hoboken for the students who were en route to their homes for Easter.

"The wireless telegraph can be depended on between fixed stations, and between moving trains and fixed stations. There are many uses for the wireless telegraph in railroad train operation. It enables the dispatcher to communicate direct with the train, and train orders can be transmitted as accurately and reliably as by telegraph or telephone."

The Lackawanna superintendent then added: "During the year 1914 we had two storms, one in March that completely wrecked pole lines in New York, New Jersey and Pennsylvania, and the only communication we had for a period of 10 days was the wireless. Again early in December this same zone was visited by a severe ice storm, and there was absolutely no wire communication in this territory for a period of three days. Again we were obliged to depend on the wireless service, and obtained entirely satisfactory results."

David Sarnoff, of the Marconi Company, led the discussion and answered

the general questions which his experience had taught him were most frequently asked by railroad men. John L. Hogan, Jr., followed with a comprehensive survey of railroad wireless in which he stated his belief that the "most important use for radio by the railroads is in the matter of acting as an auxiliary to wire telegraph and telephone. That point is of undoubted practical value. Mr. Foley has pointed out and Mr. Sarnoff has emphasized several instances in which the Lackawanna has saved more money than the whole radio equipment has cost them, through the use of the wireless. When things like that can be done I do not think any of us can question the practical value of such installations. Some people say that the additional investment and the cost of operation put it out of consideration. They say it would be much cheaper to install another wire over the line system, than to install radio plants. It must be admitted that the terminal plant installation of a short wire telegraph is much less costly than the wireless, but it must likewise be admitted that for distances of three hundred to four hundred miles or more, there is a difference in operating cost in favor of the radio telegraph even with the present apparatus. In addition to that saving, the economic advantage of the radio telegraph as an insurance of communication is tremendous. None of us hesitate to pay large premiums for insurance of other sorts, and so it is curious to see hesitation about insuring wire telegraph communication by installing an auxiliary radio system. It is still more curious when it is considered that this insurance of communication is not only a vital thing in itself, but that its cost is not a dead overhead charge as with ordinary insurance, but is a live useful investment, since the radio can be constantly kept in service exactly as though it were a single wire line. There can be no hesitation in stating that perfectly reliable commercial communication over distances of from two hundred to four hundred miles and more may be obtained and maintained."

Several railroad telegraph superintendents followed Mr. Hogan and the spirit in which the Lackawanna innovation had been received by them called forth from Daniel M. Brady the remark which proved the climax of the evening. Mr. Brady said:

"Following the trend of the discussion it appears to me that Mr. Foley's friends in the telegraph business are somewhat arrayed against him—at least, they were not entirely with him.

"I won't mention the name of the road which for nine years refused to use Westinghouse air brakes.

"It was Edison who has made the remark many times that electricity was only in its infancy, and I don't think any man in this room will disagree with his estimate of electricity.

"But there is one story in connection with the Chairman of the New York Central Board that I doubt has ever appeared in any railroad club paper before. It is this: The telephone, as we all know, was invented by Alexander Graham Bell. As a young man Bell was in love with a young lady in Boston whose father was the general superintendent of the railway mail service (Mr. G. G. Hubbard). When young Bell had his telephone perfected he came to New York one day looking for capital. He was introduced to Mr. Depew, and he offered him a third interest in the telephone for $30,000. The chairman debated the matter for a day or two and thought he would like to consult someone who really did know about telegraphy. So he went to the President of the Western Union Telegraph Company, Mr. William Orton. Now what do you suppose Orton told him? He said, 'Chauncey, I would be careful of that fellow. You know it is not safe to be in the same room with a man who talks that way. He is either half-witted or crazy.'

"And Senator Depew did not make the purchase.

"Mr. Chairman, wireless is coming and coming very fast."

This opinion was received with prolonged applause and the discussion closed with a few general commendatory remarks from the president.

Burt McConnell

What Wireless Could Do in the Arctic

The views and experiences of Burt M. McConnell, meteorologist of the ill-fated Stefansson expedition, as given in a special interview.

WIRELESS telegraphy could be used to good purpose by explorers in the Arctic regions in preventing life loss and effecting rescues. An account of the experiences of the members of the Stefansson expedition compels this conclusion. Stefansson himself and two companions have not been heard of since they disappeared more than a year ago. Eight other men of the expedition who were cut off from the main party are still unaccounted for. It is likely that the majority of the missing men are alive, in the opinion of Burt M. McConnell, meteorologist of the expedition, and he is planning to search the frozen seas in search of them. Wireless telegraphy may be employed to establish communication between the rescue ship and land stations while the search is being made.

Prepared for a three years' exploring trip in the land of ice, the Canadian Arctic Expedition, under the command of Vilhjalmur Stefansson, left civilization in June, 1913. The Karluk, the flagship of a fleet of four ships in the service of the expedition, met with difficulties early in the undertaking, being caught in the ice near Point Barrow, Alaska, in August. She was so securely imprisoned that she drifted along with the floes, skirting the northern coast of Alaska, until the frozen sea in which she was held came to a standstill.

This was in September and, believing that the vessel had been forced into a haven from which she could not escape throughout the winter, Stefansson took McConnell and four others ashore on a hunting trip. For two days the hunters tramped about in search of game. Then a terrific storm broke, the wind blowing with undiminished fury for four days. The gale ended, the members of the hunting party made a startling discovery—the Karluk had drifted away with the ice field in which she was locked. But the members of the little band had brief time to speculate upon the fate of the missing vessel, for they were on a small section of sand at a considerable distance from the shore. They reached the mainland without mishap, however, and made their way to Point Barrow. There they were told that the Karluk had been sighted as she drifted by in the grip of the ice field a short time before.

It was an exasperating situation for the explorer to face. Cut off from the Karluk without any means of knowing where she was, he was doubtless

driven to seek consolation in the hope that by some freak of good fortune her drifting would come to an end in such a way and place that he would be able to board her again. It is likely, too, that he felt keenly the absence of wireless equipment on the Karluk and at Point Barrow, for it was of prime importance to effect an exchange of messages between the drifting vessel and the head of the expedition.

There was nothing to be gained by an attempt to follow the ship, however, so Stefansson began preparations for exploring the section north of Martin's Point. Accompanied by McConnell and others he left that place in the latter part of March and made his way with dog teams over the ice. On April 6 he left his companions and, with Storker Storkensen and Ole Anderson, set out for a fifteen days' journey farther into the region of the unknown.

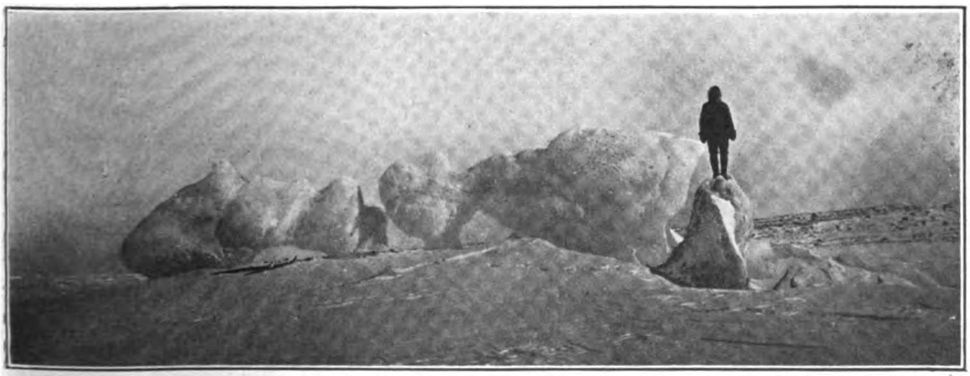
What dangers and difficulties he and his companions were compelled to contend with no one knows, for the trio of adventurers have not been heard of since. It has been pointed out that if they and the members of the party McConnell remained with had been provided with pack wireless sets much of the uncertainty regarding the fate of the three would have been done away with. It is likely that Stefansson could have sent some word at least. As it was, he and his men were swallowed up in the vast frozen tracts of the north.

In the meantime the Karluk was drifting on with the ice-field. Day after day the vessel was borne along, and finally, late in December, the members of the ship's company caught sight of land. The Karluk had been drifting in the direction of Wrangel Island and it was this land which the members of the ship's company thought they saw. As a matter of fact, however, that which they glimpsed was Herald Island.

With land in sight, those on the Karluk made preparations for establishing a camp on the ice. The rough shelter had barely been built, however, when additional ill-fortune came to the party, the Karluk being crushed in the ice.

With all haste the members of the expedition carried what they could from the vessel. Especial care was taken to rescue the twenty-seven dogs on the Karluk, it being fully realized that they would play an all-important part in the journey to the nearest land—Wrangel Island—which was eighty miles away. After every one had left the vessel the shipwrecked band gathered on the ice and watched the final destruction of the Karluk. It was not long in coming, and at length the explorers found themselves gazing at a stretch of black water which marked the grave of the ship.

The problem of reaching Wrangel Island then confronted the Karluk's people. That the journey would not be an easy one was shown by the experience of seven men who were sent



As the Stefansson expedition saw Coronation Gulf, where the ice is usually smooth

Camp of the explorers, showing the meat rack built to protect supplies from foxes and wolverines

ahead to make ready the path over which the main party planned to travel. The seven reached a point about three miles from Herald Island, when open water brought them to a halt. Therefore they stored the provisions they carried and, leaving Mates Anderson and Barker and two sailors on the ice, returned to the camp. Manen, assistant geographer of the expedition, set out soon afterward with several others on a hunting trip. They returned with the information that they had sighted Herald Island—thirty-eight miles from Wrangel Island.

Anxious to reach land, several of the scientists then determined to make their way to Herald Island without waiting for the main expedition to break camp. So Dr. A. Forbes Mackay, James Murray, Henri Beuchat and a sailor left for the island, hauling their own sledges.

It was not until February was well advanced that the main expedition started for Wrangel Island, food having been cached at various points along the trail before leaving camp. The journey was marked by many hardships. The members of the party had not been long out of camp when they were caught in a blizzard, the storm compelling them to halt for several days. Some parts of the trail were almost impassable because of huge blocks of ice and the expedition could not proceed until passages had been cut through. Finally, about three weeks after the expedition had left camp, Wrangel Island was reached.

A search was made for the eight missing men—those who had been left on the ice with provisions and those who set out before the main expedition left camp. There were no signs of them, however, and, believing that they would be found later, Captain Bartlett determined to make a dash for the Siberian shore to obtain aid.

This journey was fully as hazardous as the trip to Wrangel Island. Captain Bartlett was accompanied only by a young Eskimo. With dogs and a sled they made their way to the mainland, eighty miles distant, and struggled on over the ice to East Cape. Finally reaching Emma Harbor they had the good fortune to be picked up by a whaling vessel which conveyed them to St. Michael, Alaska. From St. Michael Captain Bartlett sent word of the

predicament of the members of the expedition to the Canadian Government and, as a result of a request made by the latter to the United States, the Washington authorities sent the revenue cutter Bear to the rescue of those on Wrangel Island. .

But the ice prevented the Bear from approaching near enough to the island to effect a rescue. The Russian Government had also been informed that fourteen persons were marooned on Wrangel Island and it ordered two ice-breakers to their rescue. The European war began about this time, however, and wireless messages were sent to the two vessels, recalling them.

On the heels of these fruitless attempts to reach the marooned folk the King and Winge, a small schooner commanded by Olaf Swenson, set out with McConnell on board to effect a rescue. After a voyage filled with many discouragements the vessel forced its way through the ice until Wrangel Island came into sight. Here were found several members of the expedition, the others being encamped on Cape Waring. After taking on board the rescued on Wrangel Island, the schooner steamed to Cape Waring, where the remainder of the party was picked up. Three members of the expedition had died after Captain Bartlett set out for aid.

It is the opinion of McConnell that the majority of the members of the expedition unaccounted for—Stefansson and his two companions and the eight missing men from the Karluk—are alive. Therefore he is devoting his energies to organizing a rescuing expedition which he plans to equip with hydro-aeroplanes. They will be taken to the Arctic in a schooner, where they will ascend, carrying McConnell as an observer. He hopes to cover with the aeroplanes Behring Straits and a strip of water 175 or 200 miles wide, extending from Point Barrow to Cape Lisburne on the Alaska coast, and also the vicinity of Wrangel and Herald Islands.

McConnell favors the establishment of a wireless station at Point Barrow by the American Government and the placing of one at Herschell Island by the Canadian Government. With the relief ship also equipped with wireless, a means of communication would be established between the rescuers and the rest of the world.

What looks here like an electrocution is an Esquimaux pastime, rope skipping

La Touraine Afire and Obidense Aground

THE worth of wireless telegraphy is being proved constantly, the latest spectacular example of its service being seen in the S O S call sent out by La Touraine, which was ablaze in the Atlantic hundreds of miles from land, with a cargo of ammunition aboard. A few minutes after the appeal had been flashed several vessels were on their way to the aid of the burning vessel.

La Touraine steamed away from New York on February 27 bound for Havre, with a most inflammable cargo, consisting largely of cartridges, turpentine and blankets. The fire was discovered in the base of one of the ventilators in the boiler room at two o'clock in the morning on March 6 when the vessel was 400 miles west of the Irish coast. The flames soon began to spread and the appeal flashed by the Marconi operators on the vessel was picked up by the steamships Arabic, Cornishman, Swanmore and Rotterdam. Wireless messages from the burning ship informed those on the other craft that the flames had alarming headway. Those on the Rotterdam, which was the first steamship to reach La Touraine, found that the members of the crew of the French liner were engaged in a desperate battle with the blaze. The Rotterdam remained nearby ready to take off La Touraine's people, but the danger from the flames was gradually overcome to such an extent that wireless messages were sent to the Arabic, Cornishman and Swanmore, telling them that their aid would not be needed. The appeal had also been picked up by a British cruiser and she came racing up at full speed only to be told that the fire was under control.

The Rotterdam accompanied La Touraine as far as Prawle Point, while two French cruisers which also came to the French liner's assistance, escorted her as far as Cherbourg. An inquiry has been begun into the cause of the fire.

Two Marconi operators — William Miller and Paul Kreiger—arrived in New York recently with a story of a New Year's Day adventure born of being shipwrecked in the North Sea. They were on the steamship Obidense, which is owned by the Cuneo Importing Company of New York, when she struck the Shipwash Sands.

The Obidense steamed away from Rotterdam early on the morning of January 1, bound for New York. She was laden with a cargo of wood pulp, chemicals and merchandise, but carried no passengers. It was about one o'clock in the afternoon of the same day and she was approximately ninety miles from Rotterdam when she struck. This is the way Miller—the senior operator—tells the story:

"I and my assistant—Kreiger—were in the wireless cabin when the wreck occurred. I felt the ship strike and went out with Kreiger to see what had happened, thinking at first that we had run against a mine. I found that the wind was blowing hard and that we were listed badly to port and shipping considerable water. The members of the crew, which numbered forty-two men, were getting out the life-preservers and we supplied ourselves also.

"All of our boats on the port side were lost when the ship struck and everyone went to work to try to launch the biggest boat of the three which were left. After three hours' work this was accomplished and twenty-six men got into it with the second mate in charge. As soon as the boat was launched, however, it became partly filled with water. In the meantime several craft nearby, among them a collier, were approaching. The large boat managed to get alongside the collier.

"When the second boat was launched everyone aboard, including Kreiger and myself, got into her with the exception of the captain and first mate. We were in the small boat for about half an hour and then a British torpedo boat destroyer picked us up and conveyed us to the shore."

Marconi's Wireless Telephone

WITHIN a few months it is expected that the Marconi Wireless Telegraph Company will be ready to announce the commercial wireless telephone, long predicted and confidently awaited.

The short distance Marconi wireless telephone now being developed for commercial use has a guaranteed working range of 50 kilometres (about 31 miles) between ships at sea carrying aerials 100 feet high and 200 feet span. This working range has been considerably exceeded in tests, during which it was also determined that the telephone can be set up, all connections made and the whole arrangement be put in working order in a half hour.

The telephone transmitter consists of a specially constructed Marconi valve, shunted with condensers and self-induction coils in such a manner that a continuous stream of oscillations is produced. The frequency of these oscillations is controlled by means of variable ebonite condensers, shown in the illustration in front of the transmitting valves. The oscillations produced by the valve being continuous and of constant amplitude give no sound in the receiver, even if the latter is placed but a hundred yards away.

The variation required for transmitting speech is produced by means of a microphone, in the use of which two methods can be adopted. The simpler method gives remarkably clear speech of better quality than is obtained with the wire telephone, and the more complex method considerably stronger speech, equal in quality to the wire telephone. The advantages of the second method are that no special care need be taken to speak loudly into the microphone and that this instrument and the receiving telephone may be placed in any part of the ship—say, the chart room—while the set itself remains in the wireless cabin. A simple change-over switch, which may also be controlled from a distance, is arranged for switching from talking to listening.

An 80 ampere hour accumulator is provided for the low voltage current used to heat the filaments of the valves. Four cases of dry cells connected in series give the high tension (500 volts) current necessary through the vacuum of the transmitting valve. An extra case of batteries is supplied for emergencies or when the others have dropped in voltage. The usual value of the vacuum current being from 10 to 20 milliamperes it is sufficiently small to make practical the use of dry cells for intermittent purposes. With the addition of a telegraph key the set can at once be adapted for continuous wave telegraphy.

How to Conduct a Radio Club

By E. E. Bucher

Article XII

IF you should undertake to inform a certain type of amateur that he is somewhat ignorant of the fundamental principles upon which the functioning and manipulation of his receiving tuner are based, you would no doubt meet with vigorous denials. He might retaliate with the statement that his apparatus already receives the government station at Key West, "clean across the United States," and that in this respect it is not outdone by the scientifically constructed tuner, even in the hands of a well-informed man.

It is indeed fortunate for the self-satisfied experimenter that the "hit-or-miss" design of much of the apparatus supplied to the amateur market happens to be within the range of "short wave" stations of amateurs and commercial companies. While it is true that a considerable degree of skill is attained frequently in adjusting to stations of this character it has often been observed that the accomplishments of the amateur referred to fail him when he attempts to build or manipulate an efficient receiving tuner that will permit the reception of signals from certain high-power stations located in this country and abroad.

The writer often wonders if this type of experimenter realizes that the foundational work laid down by commercial companies has contributed to his recreation. Would it not be in order for him to acknowledge his indebtedness to those whose pioneer efforts have made it possible for him to enjoy his hobby?

The following communication from A. P. L., of Chicago, Ill., is apparently written in such a tone of sincerity that an attempt will be made to give a satisfactory reply:

"I have been interested in amateur wireless telegraphy for the past five years and have just begun to realize that what I know of the fundamentals of the art would occupy about one column of your valuable publication.

"I have of late examined and studied every article I could lay my hands on and must say that as a whole I have deeply appreciated your contributions to the amateur field; but not once has there passed my observation a concise and complete article giving specific instruction for the general operation of the 'loose-coupler.'

"It would make your heart sick to see certain amateurs in my vicinity manipulate their receiving apparatus; while my knowledge in this respect is not excessive, I have absorbed sufficient of the basic principles to see the absurdity of the gymnastics performed by certain of my co-workers. It seems they arrive at the conclusion that just because the receiving equipment is fitted with a supply of adjustable and variable elements that

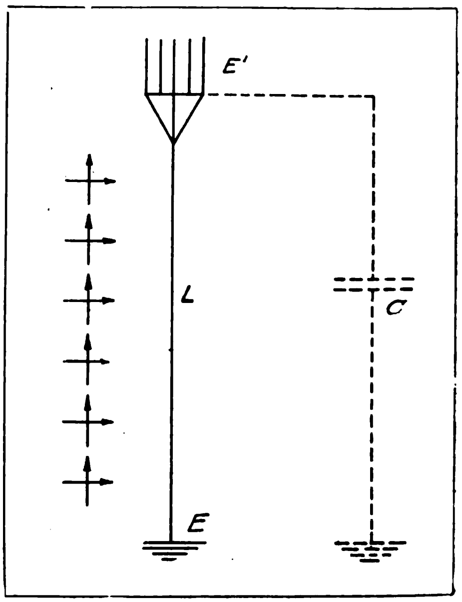


Fig. 1

these may be slid backward and forward, up and down, or any other way without regard to what is actually being done.

"Now, good sense tells me that there must be some correlated action between the various parts of the apparatus, or otherwise they would not exist. Also, is it not a fact that many of the receiving tuners to be purchased on the open market are improperly balanced as far as resonance is concerned, and therefore do not give the results which otherwise might be attained.

"I believe I express the desire of many amateurs in this vicinity when I say that if you would add in some near future edition of the series on 'How to Conduct a Radio Club' a complete disquisition on the fundamentals and details, so that one may operate the 'loose-coupler' with understanding, I feel that you would confer a great favor to the field at large."

Granting the high attainments of the amateur in the United States, it is nevertheless a fact that many of this great fraternity do not, as our contributor says, handle their apparatus with basic understanding. Since there seems to exist in certain quarters a demand for concise knowledge in regard to the operation of a receiving tuner, the following instructions are offered:

The inductively-coupled receiving tuner depends primarily for its operation on the principles of electrical resonance. It comprises fundamentally two main circuits: (1) the open oscillatory circuit with its appliances for tuning; (2) the closed oscillatory circuit in which radio signals are made audible.

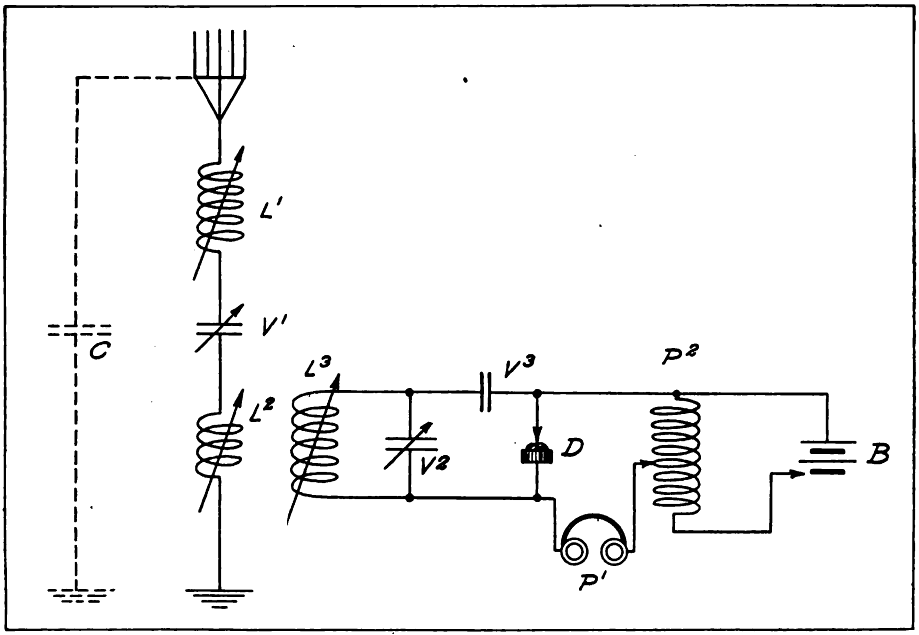


Fig. 1-A

The open oscillatory circuit generally contains three elements as indicated in Figure 1-A; (1) the aerial tuning inductance, L-1; (2) a short wave variable condenser, V-1; (3) the primary winding of the oscillation transformer, L-2.

The closed oscillatory circuit comprises (1) the secondary winding, L-3; (2) the variable condenser in shunt, V-2; (3) the fixed or stopping condenser, V-3; (4) the detector, D; (5) the potentiometer, P; (6) the head telephones, P H, and (7) the battery, B.

The writer wishes to advise the amateur field that the circuit diagram given

in Figure 1-A contains the potential requirements of an efficient receiving set and no deviation from the method of connection given will afford increased results.

Natural Wave-Length of the Aerial

The aerial, E, E^1, in Figure 1 is said to have a natural time period of vibration, meaning that a certain length of time is required (fraction of a second) for an oscillation to complete the circuit. E to E^1 back to E, the actual time being obtained by the equation

$$T = \sqrt{\frac{L\,C}{5{,}033{,}000}} \qquad \text{(No. 1)}$$

Where L is expressed in cms. and C in microfarads.

The capacity value, C, and the inductance value, L, of the plain aerial shown in Figure 1 is said to be "distributed," rather than being "lumped" or concentrated as is the case with a distinct coil of wire or two plates of an ordinary condenser.

The inductance value of the aerial circuit may be defined as the ability of the wire E, E^1, to store up energy in the form of magnetic lines of force, while the capacity value is the ability of this same conductor to store up energy in the form of electro-static lines of force; the aerial wire acting as one side of the condenser, the earth the opposite side.

For purposes of illustration, the effective capacity of the aerial in the drawing (Fig. 1) is indicated by the dotted lines, from which the elementary student will understand that the so-called open oscillatory circuit is not in reality "open," but in a sense is much similar to the closed circuit oscillator. Since this single vertical aerial wire contains the primal elements of an electrical circuit in which oscillations of radio frequency may flow, we may use the simple formula

$$N = \frac{5{,}033{,}000}{\sqrt{L\,C}} \qquad \text{(No. 2)}$$

to determine the frequency of vibration.

(It should not be forgotten that this formula is based on the assumption of a strictly closed circuit oscillator with concentrated capacity and inductance. A prominent physicist has lately shown that in certain cases where L and C represent distributed values, proper allowances must be made.)

If the wave-length of the antenna circuit is definitely known, the frequency of vibration may also be obtained from the following formula:

$$\lambda = \frac{V}{N} \qquad \text{(No. 3)}$$

where V is the velocity of electro-magnetic waves in ether (300,000,000 meters per second) λ the wave length in meters, and N the frequency of vibration.

Or we may write

$$N = \frac{V}{\lambda} \qquad \text{(No. 4)}$$

Having obtained N we may again write:

$$T = \frac{1}{N} \qquad \text{(No. 5)}$$

where T = the time period of the circuit, generally expressed in an extremely small fraction of a second.

We may re-write equation No. 3.

$$\lambda = 59.6\,\sqrt{L\,C} \qquad \text{(No. 6)}$$

where L is expressed in centimeters and C in microfarads.

An amateur's aerial having a natural wave-length of 200 meters, the frequency of vibration

$$N = \frac{300{,}000{,}000}{200} = 1{,}500{,}000 \text{ cycles per second}$$

$$\text{The time period } T = \frac{1}{1{,}500{,}000} \text{ second.}$$

In plain words, a complete oscillation will traverse the aerial circuit in $\frac{1}{1{,}500{,}000}$ seconds of time.

The foregoing being understood, it is evident from the equation No. 6 that an increase in the value of C will result in a corresponding increase of the wave-length and similarly a decrease in the value of C will cause a decrease in the wave-length.

Under the conditions indicated in Fig. 1, the value of C can only be in-

creased by adding more wires to the aerial, and may be decreased by inserting an additional condenser in series.

When V^1 is in series with the aerial, the resultant effective capacity, C_r, may be obtained from the following formula:

$$C_r = \frac{1}{\frac{1}{C} + \frac{1}{V^1}} \qquad \text{(No. 7)}$$

from which it is evident that when two condensers are connected in series, the resultant value is less than one, and moreover, when two condensers having unequal values of capacity are connected in series the resultant capacity is nearer to the value of the smaller condenser. Also, when the variable condenser V^1 is connected in series with the antenna system, equation No. 6 becomes

$$\lambda = 59.6 \sqrt{L \frac{C\,V^1}{C + V^1}} \qquad \text{(No. 8)}$$

The junior experimenter is informed that the capacity value of C of the average 200-meter amateur aerial is generally not more than 0.00025 microfarads, the average commercial ship's aerial 0.001 mfds. and in certain extreme cases 0.0015 microfarads. A previous article in the series on "How to Conduct A Radio Club" has given complete instructions for measuring the capacity and inductance of an aerial by means of a wave-meter and associated apparatus.

The student will now understand that if the capacity value of V^1 is variable, the wave-length of the open circuit is at a minimum value when the condenser is turned near to the zero position of the scale, and at a maximum value in the opposite direction or at the full reading of the condenser scale.

The condenser, V^1, is therefore known as the short wave condenser for the reason that it enables the antenna system to be adjusted to wave-lengths below the natural value (due to the distributed L and C alone).

And in the same manner we may define the coil, L^1, as being useful in affording wave-length adjustments beyond the natural period of the receiving aerial.

It is of importance to know that if the condenser, V^1, is inserted in series with the plain aerial shown in Fig. 1, which, for purposes of illustration, might have a natural period of 500 meters, that wave-length adjustments below one-half of this value cannot be obtained. Even with the condenser set at the minimum value of capacity, which would probably be close to zero, the lowest wave-length adjustment that might be obtained would reside in the vicinity of 285 meters. If near to half the wave-length value was obtained it would simply mean cutting off the aerial from the earth circuit.

It requires no further explanation to state that an antenna having a natural wave-length of 500 meters is totally unsuited for the efficient reception of 200-meter waves.

When the coil, L^1, alone is inserted in series with the antenna circuit, the total effective value of L in formula No. 6 is increased by a definite amount and equation No. 6 is then written

$$\lambda = 59.6 \sqrt{(L + L^1)\,C} \qquad \text{(No. 9)}$$

and when both L^1 and V^1 are connected in series,

$$\lambda = 59.6 \sqrt{(L + L^1) \frac{C\,V^1}{C + V^1}} \qquad \text{(No. 10)}$$

It will soon be discovered that with a given aerial the limits of wave-length adjustments by the addition of inductance are not as quickly reached as when efforts are made to reduce the wave-lengths by the addition of a series condenser. In fact, inductance may be added to the aerial circuit up to that point where the high frequency resistance of the wire does not seriously damp out the desired energy.

Oscillation Transformer and Coupling

The coil, L2, is known as the primary winding of the oscillation transformer and is simply employed for the production of magnetic lines of force to act upon the secondary winding, L3. For practical purposes only sufficient turns need be included at L2 to give the desired degree of magnetic coupling with L3.

It is of value that the inductance of winding L2 be adjustable over a given range.

Setting Up of Energy

In Fig. 1 the energy arriving at a given receiving station from a distant transmitting station is represented by the crossed arrows, the vertical one representing the static flux in the advancing wave, the horizontal one the magnetic flux.

These two forces act simultaneously upon the wire E, E^1, and set up in it energy which oscillates in the circuits L, C; that is to say, the wire E, E^1, is cut at right angles by the magnetic lines of force, while it is charged by the static lines of force.

The arrival of these trains of flux at a given receiving station must be in agreement with the natural time period of the circuit E, E^1; otherwise little energy will flow. More clearly, a half cycle of the oscillation must complete itself in the circuit, E, E^1, before another half cycle of flux arrives; otherwise the existing energy from the first half will be opposed with reduced current flow. This simply implies that the product of the inductance by the capacity in the antenna circuit of the distant transmitting station must equal the product of the inductance by the capacity at the receiving station. This is the phenomena of electrical resonance, the basis of Mr. Marconi's famous patent, and the only conditions under which the maximum value of energy will flow in the receiving aerial.

When the amateur experimenter adjusts the two variable elements, L^1, V^1, he gives his aerial a natural frequency of vibration similar to that of the distant transmitting station. The coil, L^1, and the variable condenser, V^1, are therefore often referred to as being the frequency determining elements of the receiving aerial.

The question naturally arises: "Would it not be a more desirable and a more efficient arrangement to erect an aerial of proper dimensions so as to have a natural period near to that of the distant transmitting station, and are there not some losses due to the addition of these variable elements in the antenna circuit?" The answer is "yes" and "no." Further consideration must be given before definite conclusions can be drawn.

The secondary winding, L3, and the variable condenser, V^2, in shunt constitute the closed oscillatory circuit in which currents of radio frequency (more than twenty thousand per second) flow. Since these two elements are variable, the wave-length of that circuit is variable.

It is necessary for purposes of receiving that the coil, L 3, be placed in inductive relation to L 2 in order to absorb energy from it. By definition L 3 is in inductive relation to L 2 when it bears such position to L 2 as to be cut by the magnetic lines of force emanating from it.

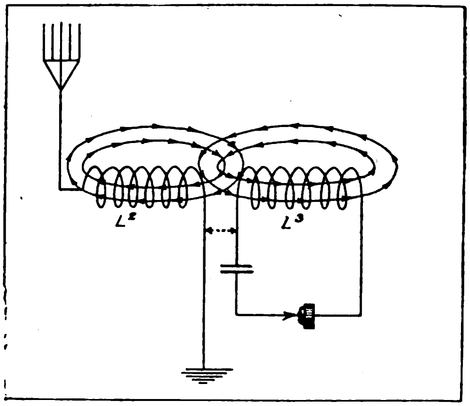


Fig. 1-B

This action is delineated more clearly in Fig. 1 B, where the lines of force during any particular half cycle take the path shown. If the current in the antenna circuit reverses at the rate of 500,000 cycles per second, the lines of force in L 2 will reverse their polarity correspondingly, and the coil, L 3, will have current set up in it of this frequency.

When electrical energy finally flows in L 3, magnetic lines of force are also set up about it, which in turn react upon L 2. This interlinking of the two fields of force is known as "coupling" and the term may thus be briefly defined.

The expressions "tight" and "loose" coupling are strictly relative and com-

parative; in fact no hard and fast lines can be drawn.

In amateur's parlance, the tuner is "loosely" coupled when L 3 is drawn to a considerable distance from L 2, but for the trained engineer a more concrete expression is required, viz.:

$$K = \frac{M}{\sqrt{L_2 L_3}} \qquad \text{(No. 11)}$$

Where M = the mutual inductance value between L 2 and L 3,
L 2 = the self-inductance value of the primary winding,
L 3 = the self-inductance of the secondary winding.

It is, therefore, not the actual distance alone between the primary and secondary windings which determines the co-efficient of coupling, but the factor is likewise dependent upon the number of turns, or, in other words, the self-inductance values of either coil under any particular given set of conditions.

It is clear that the closer the used turns of L 2 are placed to the used turns of L 3 the greater will be the degree of coupling; and likewise that a decrease is effected when L 3 is drawn away from L 2; furthermore with the conditions depicted in Fig. 1 C, the value of coupling is less than that shown at Fig. 1 B on account of the increased distance between the windings.

It is highly desirable during receiving operation in the majority of cases for strength of signals to absorb the maximum possible value of energy from the antenna circuit for the operation of the local detector circuit. This the variable coupling feature of the receiving tuner allows, and at the same time assists in the prevention of interference due to the overlapping of frequencies.

The wireless operator soon observes that whenever the coupling of the primary and secondary circuits of his receiving tuner is changed (while receiving signals from a distant transmitting station), it is necessary to readjust the values of self-inductance in both the open and closed oscillatory circuits for the louder signals. This may be accounted for by the fact that when a

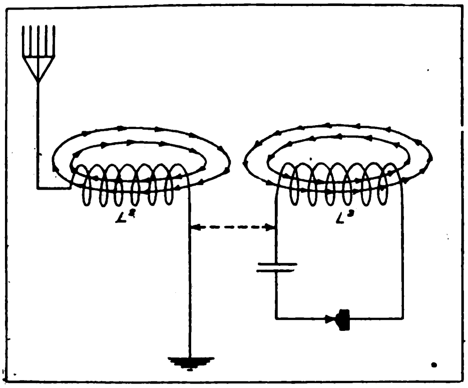


Fig. 1-C

transference of energy takes place between the primary and secondary turns and the magnetic lines of force interlink, the effective self-inductance of either circuit is altered and from formula No. 6 a corresponding change in the wave-length must take place.

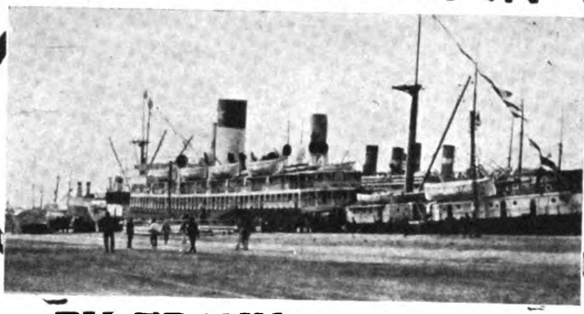
The concluding installment of this particular article of the series on "How To Conduct a Radio Club," will appear in the May issue of THE WIRELESS AGE. *The author will give practical advice for the operation of the inductively-coupled receiving tuner under all possible conditions of service.*

THE INSTITUTE MEETING

A record making number of over 200 attended the March meeting of the Institute of Radio Engineers, at which Edwin H. Armstrong presented an exceptionally interesting paper on "Recent Developments in the Audion Receiver." Mr. Armstrong described in detail the regenerative receiver with which his name has been identified and outlined its use both as an amplifier and a "beats" receiver for sustained waves. The paper was discussed by John Stone Stone, who spoke of some early work with amplifiers, and John L. Hogan, Jr., who gave the results of some comparisons of sensitiveness and reliability between a number of forms of heterodyne receiver, including the audion type.

The next meeting will be held at Fayerweather Hall, Columbia University, New York, at 8:15 P. M., April 7th.

IN AND OUT OF THE WAR ZONE



BY FRANK J. DOHERTY

THERE is considerable difference between cruising about the deep as a wireless operator in the shadow of war clouds and voyaging in the days of peace. This is a truism, even though the vessel on which you may be detailed is not under fire once and perhaps has not so much as earned the distinction of having been chased by hostile craft. I came to this conclusion after I had completed a voyage from New York to Genoa and return on the Antilles of the Southern Pacific fleet.

The Antilles was chartered to steam to Genoa to bring home folk from this country who had been stranded in Italy because of the European war, being the first American passenger ship to visit the Italian city in ten years. When I received word of the cruise that was planned my feeling of exultation over the fact that I would have an opportunity to obtain, as it were, a glimpse of how the wheels go around in the war was mingled with the realization that it is far from pleasent to get in the path of the formidable fighting machines which patrol the seas during disputes between the rulers of nations. But I knew that a wireless operator is more or less of a soldier; that his duty is to obey orders and go where his work takes him regardless of his personal feelings. Then, too, the voyage held in it the prospect of good remuneration. So I resigned myself without perturbation to whatever might happen.

The departure of the Antilles from New York was surrounded by circumstances which, to the person of imagination, might be construed as fraught with harbingers of possible disaster. Among the first of what one man described as ill omens was the sight of a newspaper containing a headline that screeched out in big black letters, "Italy Declares War With Austria." As a result of this announcement a considerable quantity of mail destined for Austria was unloaded just before the vessel sailed. While we were steaming down the bay it seemed as if every craft equipped with a whistle saluted us. Most of us took the salutes as expressing wishes for a pleasant voyage, but others found in them a message which read, "Good-bye you poor beggars, you'll never see America again."

The forebodings of the pessimists were soon forgotten, however, in the interest aroused by our cruise. After we

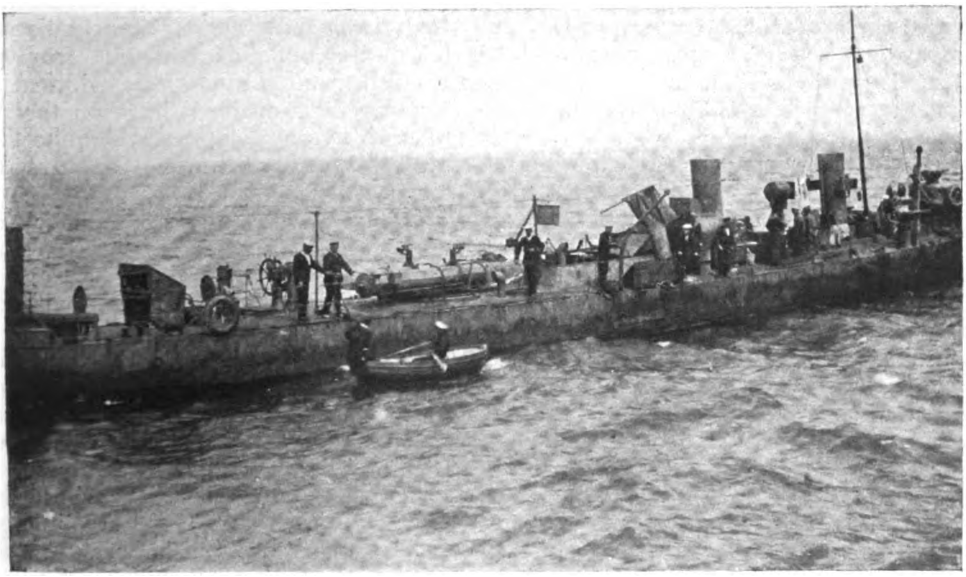
had dropped our pilot at Ambrose light ship the Antilles stuck her nose into waters she had never churned before and shaped her course a little to the northward of the great circle course between New York and Gibraltar. The first leg of the voyage made us skirt the Grand Banks and then we bore eastward, crossing the trans-Atlantic lane and graduating down to pick up Cape St. Vincent, Portugal.

Our course was laid out on a big chart with a pin sticking in the pencil line to represent a large iceberg ahead of us. We of the Antilles, which had been cruising in the Gulf of Mexico, were not familiar with this menace to navigation and it was the subject of much speculation. We looked forward, of course, to obtaining a good view of the berg. Great was our disappointment, therefore, when we passed the "growler," as the huge mass was called, in the darkness—to be exact at three o'clock in the morning. We were made aware of its proximity, however, by the crunching of the floe ice against the sides of the Antilles and a drop of thirty degrees in temperature.

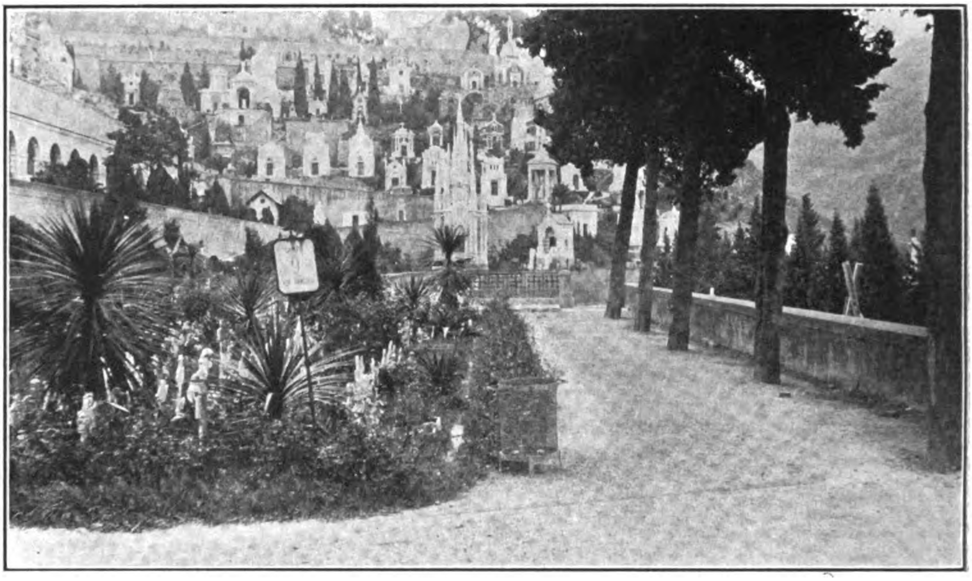
This incident was soon forgotten and the war and the dangers attendant upon those navigating the seas again became uppermost in the minds of not a few. The degree to which the imagination tricked some of the men on the vessel was illustrated when we reached a point where the longitude and the latitude begin to attain equal figures. I was walking on the deck one morning when I caught sight of several members of the ship's company and one of our passengers wildly gesticulating and looking through glasses with intense interest toward the horizon.

I approached them to learn the cause of the excitement, but the members of the group were so much absorbed in what held their attention that at first I did not obtain an answer to my inquiries. Finally I was told that a naval battle was in progress and, hardly able to wait until I could lift a pair of glasses to my eyes, I peered over the waves in the direction in which the others were looking.

What I saw thrilled me through and through. The powerful glasses brought the ocean and everything on it into plain view and in the distance I discovered what looked like a warship. She was sinking apparently, but continued to fire broadside after broadside. It all seemed real enough—the splashing of the water as the shells fell into the ocean, the gradual settling of the vessel into the sea. This was war at first hand indeed! I was glad that I was on the Antilles. The incident would sound well in the telling



As the Antilles came into sight of Gibraltar a rakish torpedo boat with the British Admiralty flag at her stern hoisted the signal to "stop immediately"



A view in Genoa. It is a somewhat remarkable fact that the Italian city, which has such a wealth of handsome architecture, has a dearth of masterpieces in paintings

when I reached New York once again.

It remained for the captain to disillusion us. From the bridge he, too, had witnessed the supposed battle. But his experienced eyes, with the advantage of better glasses, had shown him that what we saw was a tramp steamship of the vintage of long ago pitching in the seas. The rays of the sun striking her bow and stern as she tossed up and down provided the broadsides for our picture; the spray she was throwing about represented the shells splashing in the water, and her low free-board gave her the sinking effect.

This is only one of many amusing incidents that helped to give variety to the voyage. I could write at length concerning the diverting happenings and persons that I encountered as we ploughed through the waves to our destination. But, after all, this is a story told by a wireless operator and I do not feel that I ought to wander too far from my text —in other words, this article concerns in the main the things that are wireless. So let us turn to the radio room for a short time at least.

As I remarked before, times are not normal on the seas. There are not so many ships afloat as there are in times of peace and consequently the number of sparks that come in is diminished. So, with the exception of the British cruisers' sing song code, there was little during the day to hold the attention of the man listening in. But at night it was different. Then came the welcome "KA, KA, CQ, Presse," of Poldhu's fine ringing spark to give all the details of the war. In fact MPD (Poldhu) reached us long before the signals from Cape Cod grew faint and I eagerly listened to all the bulletins sent out from the English station until we docked at Genoa. This enabled those on the Antilles to live in a little world quite their own. We heard Europe, so to speak, long before we saw it.

On the evening of the tenth day out from New York as one of the ship's officers expressed it, we split the Cape St. Vincent light directly in half with our fore peak. This was a signal for all on board to rush to the rail to obtain what was to the majority their first glimpse of Europe. The arrival of daylight showed that our first sight of land was a gray hill in a corner of Morocco. A heavy haze hung about the shore line, but in imagination I could see little oriental Tangier nestling between the hills with its picturesque houses and people The Antilles proceeded on her voyage

and soon the hills of Spain came into view. We didn't know just exactly where Gibraltar was located and all with cameras were anxious to snap the "Gib." Therefore we leveled the apparatus at every hill which showed its head through the mist in order not to miss obtaining a photograph of the famous rock.

We were beginning to believe that we had missed it when we came into sight of a massive formation standing out from the main land and we knew at once that it was Gibraltar. Almost at the same time a rakish torpedo boat with the British Admiralty flag at her stern laid across our bow with the signal hoisted to "stop immediately." As she dipped her nose in the swell a few times and loafed alongside, she looked formidable enough. The commander of the little craft—well tanned and polite—talked through his megaphone with the captain of the Antilles and then said that he would send a man aboard the latter. A ladder was lowered over the side of the American vessel and, to the accompaniment of the clicking from many cameras, a short stocky officer in heavy boots hobbled along the decks. The thought occurred to me that perhaps he would make a search for Germans, but he didn't. He only asked casually regarding the number of Germans aboard and then inquired of the purser about the accommodations for passengers. In fact, he remained aboard the vessel only a short time, and then we steamed on.

It is needless to say that the camera brigade was extremely busy while the Antilles was passing Gibraltar. There were many interesting stories told about the place also, but I won't attempt to repeat them. I was interested, however, in a rumor to the effect that at the great docks at the foot of the rock were moored sixty-nine captive German merchant men.

After we had passed Gibraltar and were well out in the Mediterranean I received an idea of what jamming really is. In fact, I have designated the wide expanses of water east of the coast of Spain as the free-for-all jam zone. And the operators on the land and ship stations of the Mediterranean certainly understand the art of jamming. They all exchanged war news and the long drawn out "pse. O.M." (please, old man) and "tks O. M." (thanks, old man), must have plunged the commanders of the battleships into despair.

I spent many an hour "listening in." The operator on the Queens Castle, bound for Calcutta, felt it necessary to exchange the time of day and the war news with the wireless man on a craft bound from Copenhagen to Geona. They tested each other's tones, passed "tks O. M." back and forth many times and finally ceased sending with expressions of good will. Then Cadiz, Cape Palos and Barcelona—all good stations in Spain—claimed my attention. CQ continually filled the air. And as English seemed to be the universal language of wireless men I had no difficulty in keeping in touch with what was going on.

I found considerable amusement in working with the operator at the Cape Palos station. After sending to him the first time and receiving no answer I thought he had left me or been interfered with. There was an interval of about three minutes and then he began to send with enough laboriously spelled out English to convey his meaning. This occurred on every occasion that I talked with Cape Palos.

Hugging the Spanish coast we made our way steadily northward, and on the morning of September 5 the blue hills of Italy were sighted with the city of Genoa sloping down to the edge of the water. Soon afterward we took aboard a pilot who backed us down a narrow strip of water between a large number of ships until our stern rested near a quay. The vessel was far enough away from the landing place, however, to give boat men an opportunity to earn a considerable number of pennies by conveying persons to and from the ship. Our arrival was the signal for a launch filled with petty port officials to come alongside. Several of them spoke English fluently and they remarked on the novelty of seeing our flag in Genoa. The members of the crews of the ships nearby seemed glad to see us. They gathered at the rails of the vessels and shouted compliments and jests as we tied up to the pier.

I had heard a great deal of the marble palaces and architectural beauties of the city and was eager to go ashore. I had not long to wait, for the Antilles soon docked, this being the signal for those on the vessel to begin their explorations of the city. The description of the architecture in Genoa, I found, had not been exaggerated, and I was not disappointed in what met my eyes during my wanderings about the city. The Cathedral of San Lorenz, which is the oldest of the eighty-two churches, was founded in 985. It was built in the Romanesque style about 1100 and restored in Gothic in 1307. In 1567 it was given a Renaissance dome. The church contains statues, paintings, vestments and relics. The most interesting of these is probably the Sacro Catino in which, as the story goes, Joseph of Arimathea caught drops of blood of his crucified saviour. The Santissma Annunziata is a church notable for its magnificence.

It is a somewhat remarkable fact that Genoa, which has such a wealth of handsome architecture, has a dearth of masterpieces in paintings and sculpture. However, there are meritorious paintings by Paris Bordone, Bassano, Van Dyck and Rubens. In the church of Santo Stefano there is a well known painting by Giulo Romano, the "Stoning of Stephen."

What interested me as much as anything that came to my attention was a marble statue of Columbus in the Piazza Acquaverde before the railway station. This memorial was sculptured by Canzio in 1862. It has four allegorical figures representing Religion, Science, Strength and Wisdom, while at the foot is a representation of America. But this was not the only evidence of the high esteem in which Columbus is held, for on the pediment of the Palazzo Farragiana are scenes from his life shown in marble relief. A mosaic portrait of him is also on view in the Palazzo Municipale.

I spent some of my time roaming about the business section of the city in search of souvenirs. Here I found an air so commercial and full of bustle that I was inclined to compare it favorably with some thoroughfares in American cities. The folk I saw looked alert and dressed well, while the tradesmen displayed no little shrewdness in disposing of their wares. The cunning of the small shop-keepers was illustrated by the fact that several passengers on the Antilles purchased a number of articles under the impression that they were never imported into America only to learn afterward that they were on sale in Fourteenth street, New York City.

The six days which we spent at Genoa passed only too rapidly. Finally, however, the last of the war-driven Americans who were to return to their homes on the Antilles reached the vessel and the hour for steaming away was set. On the pier gathered a crowd of Genoese, interestedly watching the preparations incidental to the voyage. Suddenly they gave way to permit three musicians—an aged man and two little girls—to reach one side of the pier. As they made ready to play a murmur of interest arose from the folk on the decks of the Antilles. It seemed fitting enough that we should depart from Italy with music from its natives to stir our memories of the land we were leaving behind.

I was anticipating an Italian national anthem or an air from grand opera. The man, who was carrying a harp, took considerable time to tune his instrument and then one of the girls—she had a violin at her shoulder—began to follow his example. The other girl, who carried a tambourine, was the only one of the trio who was ready for the concert. It seemed to me as I watched the old man and the girl with the violin tuning their instruments that unconsciously they had an excellent sense of the dramatic and the knowledge of how to awaken suspended interest. For almost everyone on the Antilles was watching the musicians and waiting for the first strains of melody to reach their ears.

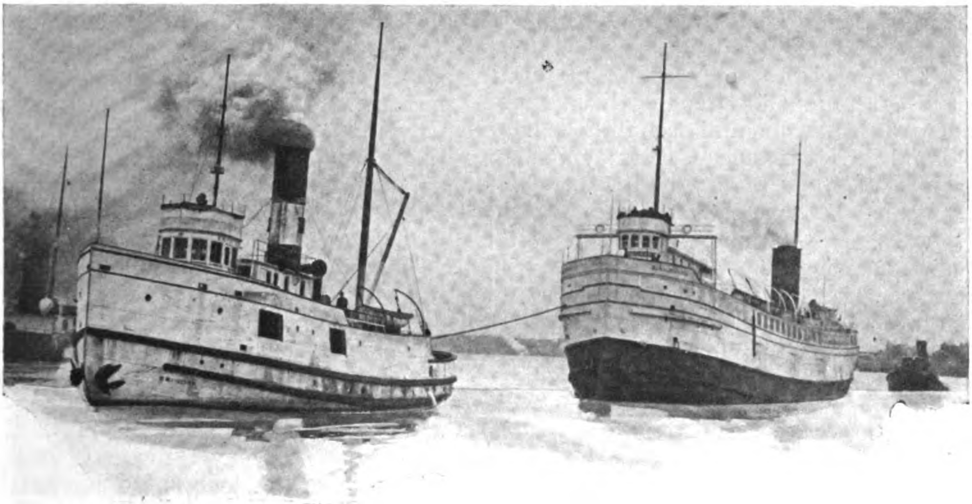
At last the tone of the harp harmonized sufficiently to suit the musician and the violin player seemed to be in an equally satisfactory state of mind regarding her instrument. A man near by shoved me aside so that he could get closer to the rail; back of me I heard a woman admonishing her daughter to be quiet.

Then I heard an air that was vaguely

familiar. It set my pulses bounding and my heart tripping; it took me back across the waters until I could almost see the Statue of Liberty and the Woolworth building in New York City and hear the shouts of "step lively!" in the subway. This was not an Italian national anthem! It was the tried and true "Yankee Doodle!" And it was played with spirit enough to satisfy the most Americanized of Americans.

Thus we took our leave of Genoa. I was sorry and yet glad to see our prow pointed toward the ocean lanes which lead to America. Behind me was a city which held many pleasant recollections born of my excursions about its many odd nooks and corners, while before my eyes was a picture conjured up by the magic word home and all that it implies. Fainter and fainter became the music from the pier. Finally all that I could hear were occasional notes from the violin. At last even these were lost in the noise of the waters rushing by the sides of our vessel. Then I realized that our visit to Genoa was indeed something that belonged to memory only and that we were well started on our homeward voyage.

QUICK AID FOR STEAMER



Towing the Lakeland into Port Huron

The steamer Lakeland, of the Port Huron & Duluth Steamship Company, on her way from Port Huron, Mich., to Alpena, Mich., for a cargo of cement went ashore at South Point, about eighteen miles from Alpena, on the morning of November 10 last. The Marconi operator, H. C. Rodd, sent out distress signals at 5:30 A. M., the signals were picked up by the Cleveland, Ohio, Buffalo, N. Y., and Tobermory, Ont., stations and promptly forwarded to the wrecker Favorite, of the Great Lakes Towing Company, at St. Ignace, Mich., a distance of about 105 miles. The Favorite was under way and started for the wreck an hour after the steamer went ashore. The Favorite and Lakeland were in constant communication by wireless and ordered out the life saving crew at Alpena to take soundings for the Favorite. All signals and orders were exchanged between the wrecker and the Favorite by wireless.

Chapter XIII

AS described in previous issues of this series, it has been the custom of the Marconi Wireless Telegraph Company of America to employ as the auxiliary or emergency set an induction coil (with magnetic interruptor) energized by from 16 to 30 volts of storage battery.

The desirable features of an auxiliary equipment having increased range of transmission and reliability have long been realized. Careful consideration of the requirements involved have led to the final adoption of the type E ½ k.w. transmitting panel as the emergency apparatus, the current for the motor generator being supplied by 60 storage cells of the Exide type connected in series.

While the set may be operated totally independent of the ship's generator, connections are arranged for direct use of the power from the ship's mains. The installation of this battery unit requires a charging panel of new and special design, and demands some explanation for those under whose direction it is to be placed. When used in this manner the storage battery unit and the charging panel are the property of the steamship company and are generally placed directly under the supervision of the chief engineer; the panel transmitting set is the property of the Marconi Company, for the maintenance of which the operators in the Marconi service are held directly responsible.

All operators in the Marconi service should be sufficiently familiar with the complete circuits of this installation and the general manipulation as to enable them to make intelligent use of the charging panel in order to keep the battery in a normal state of charge. Careful study should be made of plate No. 1 which is a rear view of the charging panel, facing the operator showing the actual placing of the indicating instruments and associated apparatus. Identical connections are given in a more simple manner in the diagrammatic sketch. (Fig. 2.)

The functioning of the equipment will be better understood from the following explanation:

Since the voltage of the 60 cells connected in series is equal to and somewhat above that of the charging D. C. line (125 to 130 volts), it becomes necessary to split the battery into two separate series units which, in turn, are connected in parallel to the D. C. line.

In the drawings (Figs. 1 and 2) these units are designated as battery A and battery B.

Charging Circuits

The charging circuit from the D. C. line to the battery cells, includes on the "positive" side, in series with each unit, three resistance coils of a fixed value for regulating the number of amperes flowing through the individual units.

One of the resistance coils, connected in series, with battery unit B may be reduced to one-half of its value by the switch, S-5, or wholly cut out of the circuit by means of the switch, S-6.

Similar functions are performed by the switches, S-7 and S-8, in connection with the resistance coils connect-

ed in series with battery A. The negative pole of the charging circuit to the cells includes a double scale ammeter, an overload circuit breaker fitted with a shunt trip and a reverse current and underload trip.

The ammeter is for the purpose of indicating the current consumed by battery units A or B when on charge and when discharged gives a reading of the number of amperes flowing through to the motor generator of the auxiliary set.

When battery units (A and B) are being charged simultaneously, the ammeter indicates the amperes flowing to the two units and, if it is desired to ascertain the current in amperes flowing to a single unit, the value can be obtained by pulling the charging switch to the other unit, leaving the single unit connected to the D. C. mains.

For practical operation a little explanation here may not be amiss:

It may be observed under certain conditions that when both units are on charge, ten amperes are passing through the cells; if, however, one of the units is disconnected, the ammeter will indicate 7½ amperes flowing to the single unit. This is due to the fact that when both units are placed on charge there is a drop of potential on the line which decreases the current value flowing through the cells as a whole. When, however, one unit is removed from the charging circuit the potential across the remaining single unit rises and therefore causes increased flow of current.

Under normal conditions equal values of current should flow to battery units A and B. The overload circuit breaker acts as a check upon the current flowing to the battery cells and if more than a predetermined amount passes, the circuit is automatically opened. The same statement applies when the battery cells are on discharge, the circuit breaker acting in a similar manner. The number of amperes necessary to open the circuit breaker may be adjusted through a given range by means of an adjustment device furnished with the instrument.

The circuit breaker will likewise interrupt the circuit when the battery cells are on charge through the agency of a shunt trip circuit which is operated by the Sangamo ampere-hour meter. When the cells have attained a full charge as indicated by the ampere-hour meter, the overload circuit breaker is released, automatically breaking the circuit.

The overload circuit breaker is also controlled by a reverse current and underload tripping mechanism. Should the polarity of the D. C. line become reversed, the charging circuit is automatically disconnected, protecting the cells from obvious damage. And again, if the voltage of the charging circuit falls below a certain value, the line is automatically opened, preventing the cells from discharging back through the ship's generator windings.

The general operation of the switchboard will be better understood after directions are given for the use of the remaining switches.

When the switch, S-1, is in the up position it allows the motor generator to be operated from the ship's mains (D. C. line). In the down position the energy for the motor generator is furnished by the storage cells. Switch S-2 in the up position allows the battery B, to be placed on charge, switch S-3 performing a similar function in respect to the battery A. When both S-2 and S-3 are in the down position, battery units A and B are connected in series for discharging purposes. Switch S-4 allows voltage reading to be observed on either battery unit A or B. Switch S-9 is the main D. C. line switch and disconnects the charging circuit from the ship's mains.

The switch S-10 must be open to allow the batteries, when fully charged, to be discharged through the motor generator. The necessity for this will be explained later. A small pilot lamp is connected across the storage cells when placed on discharge.

The use of the switches S-5, S-6, S-7 and S-8 has been previously covered and it is now only necessary to mention that they are for the purpose of selecting three different values of current to flow through each individual battery unit under given conditions.

The discharge circuit from the storage cells to the motor generator includes the ammeter, the overload circuit breaker with shunt trip operated by the Sangamo meter and the ampere-hour meter itself which is now connected in series with both battery units A and B.

It is customary to speak of the capacity of a storage cell in terms of ampere-hours. By definition, an ampere-hour is the amount of energy represented in a circuit when one ampere of current flows during one hour of time. If ten amperes flow during one hour's time, the energy represented would be referred to as "ten ampere hours." The Sangamo ampere hour meter is for the purpose of indicating the number of ampere hours of energy that have been delivered to the battery on charge or taken from it on discharge. When the battery is in a state of full charge the pointer of the ampere-hour meter is at the zero position. As current is gradually taken from the cells the pointer on the meter scale will indicate the ampere hours of energy which have been consumed. If the battery is then placed on charge, the ampere-hour meter pointer will gradually return to the zero position which, when reached, closes the circuit to the shunt trip of the overload circuit breaker, automatically disconnecting the charging circuit.

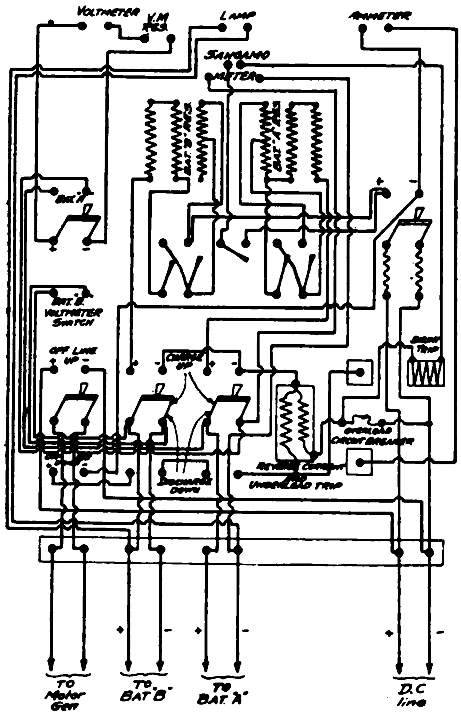


Fig. 1

The ampere-hour meter is essentially a small motor of unique and special construction, which is connected in series with the line and through a mechanism operates the pointer over a dial. It will be at once understood that this meter gives an invaluable check on the state of charge or discharge of the storage battery unit.

It should be noted that on charge the ampere-hour meter is connected in series with only one of the battery units (A) and it is assumed that the battery unit B is to be charged simultaneously. On the basis that the conditions of the two battery units are equal, the ampere-hour meter being connected in series with one of the units, gives a check on the condition of the second unit.

Inequalities in the two units, with proper care, should not exist, but if they do, may be ascertained, checked and compensated for by individual specific gravity and voltage readings of the cells singly and as a unit. It will be readily understood why the ampere hour meter is only connected to one of the battery units. If it were connected so that it indicated the ampere hours flowing to both units it would register double the number of ampere hours which the battery is to represent on discharge.

An important consideration in this respect is the fact that while it is theoretically possible to take the same energy out of a storage cell as is put into it, yet in actual practice this condition does not obtain; it is therefore necessary to charge the battery for a slightly longer equivalent period than that at which it is discharged. The ampere-hour meter is therefore furnished with a compensator which re-

quires a greater number of ampere hours of energy to be fed on charge in order to bring the pointer of the instrument back to the zero position than is required to bring it from the zero position up to any condition of discharge.

While this compensator effects the purpose desired it does not keep exact pace with the conditions of charge and discharge of the battery, and it is therefore necessary at certain periods to give the battery an overcharge. This is accomplished in a simple manner. After the needle of the instrument has returned from any given position to the zero point, it is again reset to say 10 or 15, and the battery given an additional charge until it again returns to zero. It will now be understood why it is necessary to open the switch, S-10, when the battery is fully charged, for it would be impossible to hold the circuit breaker in a closed position when the pointer of the Sangamo meter has returned to zero. After the battery has been on discharge for a small period of time, the switch on the shunt trip circuit to the overload circuit breaker may be closed if desired.

It should be the duty of operators in the Marconi service, when the ampere-hour meter indicates that a certain amount of energy has been taken from the cells, to place them immediately on charge so as to bring them back to full, normal condition. Particular care should be taken not to attempt to close the overload circuit breaker when the charge or discharge switches are in the closed position. The circuit breaker should be closed first and the main line switches follow afterward; in this manner the line is fully protected from overload.

Receiving A New Battery

The following general instructions in reference to the Exide storage cells as furnished by the Electric Storage Battery Company should be of value to those to whom the care of these cells is entrusted.

In unpacking a battery, keep the trays right side up in order to avoid spilling the electrolyte (battery solution). After cleaning off the excelsior, etc., from the top and sides of the trays, remove all the soft rubber plugs from the cells and see if all cells contain the proper amount of electrolyte. The electrolyte should be about one-half inch above the top of the plate. If the electrolyte is uniformly below the proper level, add enough distilled or other pure water to bring the level to the proper height. If the level of the electrolyte in some cells is found below the top of the plate it is due to loss of electrolyte. If due to the tray having been turned over during shipment the excelsior around the top of the tray will be wet and some acid would be spilled from all of the cells in that tray. In this case, replace the amount spilled by filling the low cells to the proper height with chemically pure electrolyte of about 1.250 specific gravity (7 parts of pure water and 2 parts pure sulphuric acid by volume).

If electrolyte in a given cell is low, due to a broken jar, the bottom of the tray will be wet, although the excelsior around the top of the tray may be dry. Replace the broken jar and add sufficient acid to make up for the amount lost. If it is found after replacing the broken jar and giving the battery an equalizing charge, that the gravity does not come to approximately 1.275, it is due to not having replaced the same amount of acid as was spilled. To adjust this, draw off some of the electrolyte from the top of the cell and add water of 1.300 acid as required to bring the specific gravity to between 1.270 and 1.280. Put the battery on charge at the low rate given on the name plate of each tray. Charge at about this rate until all of the cells gas uniformly. Reduce the current to about one-half and charge for about three hours longer, when the battery will be ready to be put into service. It is advisable, however, before putting the battery into service to take and record the specific gravity of the electrolyte of each cell. These readings serve to indicate that the cells are in a normal condition, also to show approximately how high the gravity should come at the completion of subsequent weekly equalizing charges.

The battery may be discharged without injury to the plate at any rate of current it will deliver. The battery

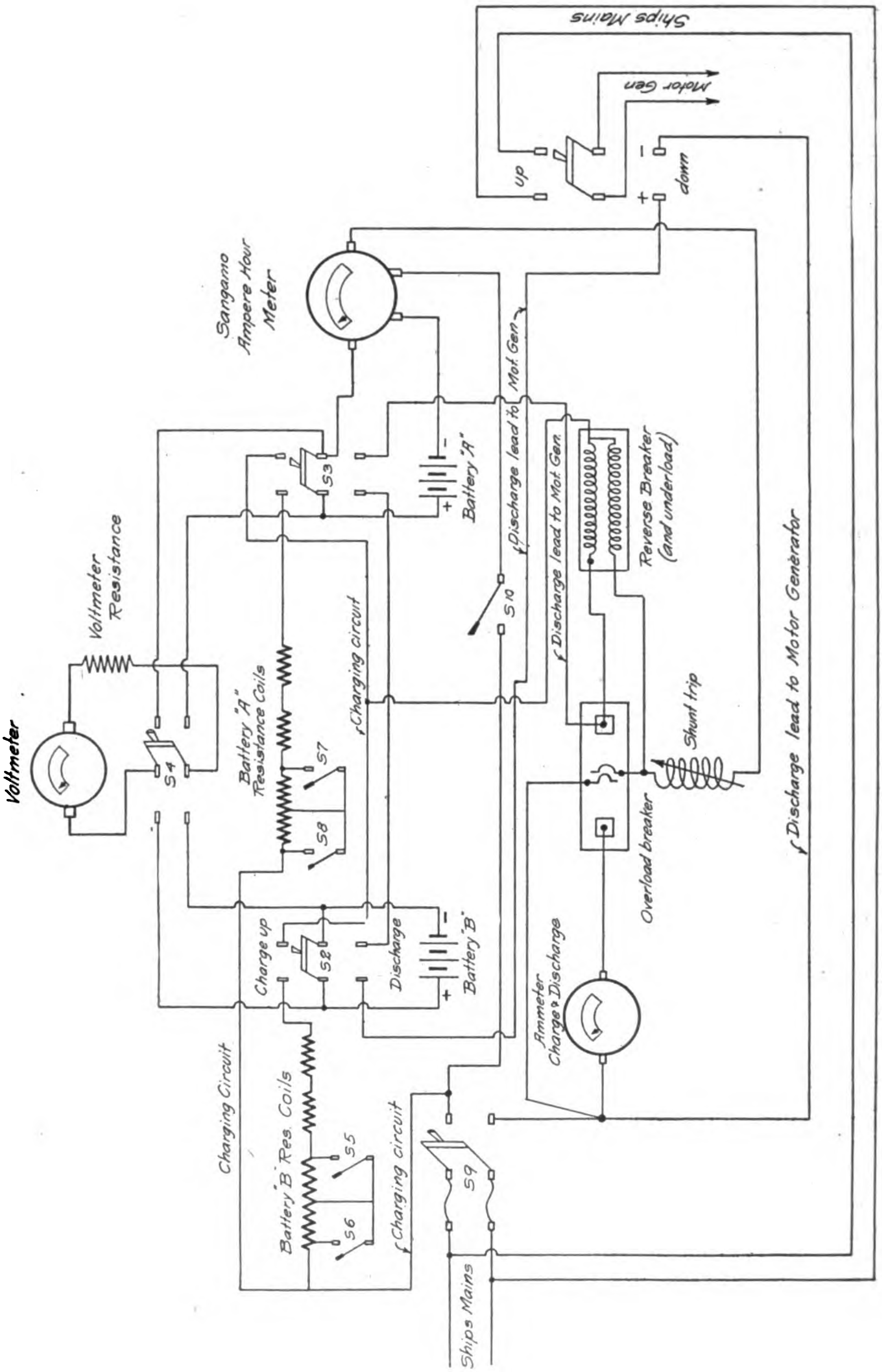

Voltmeter
Voltmeter Resistance
S4
Battery "A" Resistance Coils
S7
S8
Charging circuit
Sangamo Ampere Hour Meter
S3
Battery "A"
Discharge lead to Mot. Gen.
S10
Discharge lead to Mot. Gen.
Reverse Breaker (and underload)
Shunt trip
Overload breaker
Ammeter Charge & Discharge
Discharge lead to Motor Generator
Charge up
S2
Discharge
Battery "B"
Charging Circuit
Battery "B" Res. Coils
S5
S6
Charging circuit
S9
Ships Mains
up
down
Motor Gen
Ships Mains

Fig. 2

should be promptly recharged upon reaching 1.7 volts per cell when delivering the normal service rate stamped on the name plate.

It is uneconomical to charge the battery more frequently than once a week unless the service requires it.

A battery should never stand completely discharged.

Keep naked flames away from the battery at all times.

Keep the level of the electrolyte always above the top of the plate by replacing evaporation with pure water to a height of one-half inch above the top of the plate. This should be done before a charge.

Use only direct currrent for charging; if only alternating current is available apparatus must be secured to change it to direct.

The positive terminal of the battery must be connected to the positive wire of the charging circuit.

The positive pole may be ascertained by dipping the terminals of a 110-volt, direct current circuit into a cup of water; bubbles will appear about the negative terminal.

The charge for any of the batteries of the Exide family may be started at any available rate of current within the capacity of the charging apparatus, wiring and connections. The only limitations of the charging rate at any period of the charge are the gassing of the cells and the temperature of the electrolyte.

Stamped on the name plate of the battery are two charging rates, the lower of which is the finishing rate.

The higher figure is only given as being under usual conditions a satisfactory rate at which the greater part of the charge may be given.

When the cells begin to give off gas, lower the rate; when the current has been reduced in one or more sets to the "finishing rate" given on the name plate, continue at this rate until all the cells in the batery are gassing uniformly. If, at any time during the charge, the temperature of the electrolyte reaches 110 degrees F., the current must be reduced or the charge temporarily stopped. A full or partial charge can, in case of necessity, be given the battery in a very short time by starting the charge at a high rate. Particular care must be taken to reduce the current whenever gassing begins.

Once each week, immediately after the battery has received its regular charge, give it an equalizing charge of not less than three hours at one-half the finishing rate. This is particularly important when a battery is not charged every day.

An ampere-hour meter, when used, should be set or adjusted to give the battery the amount of charge necessary to produce the uniform gassing at the finishing rate, which indicates the completion of a regular charge. This amount is usually from ten to fifteen per cent. in excess of the discharge. The weekly equalizing charge should be given irrespective of the ampere-hour meter.

Once a month and immediately after the regular equalizing charge, check the condition of the battery by hydrometer readings. If the specific gravity of the electrolyte of any cell is higher than 1.300 or lower than 1.250, the cause should be promptly investigated and corrected.

When a battery is to remain idle for a period of not to exceed four months, see that it is in good condition and give it an equalizing charge immediately before the idle period, and again immediately before going into service.

The Electrolyte

The electrolyte in a cell consists of a mixture of sulphuric acid and water. Sulphuric acid does not evaporate, water does. When the level of the electrolyte in a cell becomes low it is due, under normal conditions, to the evaporation of water which should be replaced with water only.

There being no loss of acid it is never necessary, during normal service, to add any acid to a battery. Of course, if a battery is upset and acid spilled, or if a jar is broken and acid leaks out, it should be replaced. In the event of any cells having been flooded by wash water or for any other cause, provision should immediately be made to prevent a recurrence. Unless acid is actually known to be lost out of a cell, none should ever be add-

ed during the entire life of a battery. The amount of acid lost in spray is immeasurably small and should be neglected. Use only distilled or other water of approved purity for replacing evaporation. Most natural waters contain impurities, some of which are chemically injurious to the batteries, while others are not. Water for regular use in batteries should always be submitted to the battery manufacturer for approval.

It is necessary that the plate and separators be covered with electrolyte at all times.

Replace evaporation in the cells every five to fifteen days, depending upon the conditions of service. The best time for adding water is just before a charge.

A good method of replacing evaporation is to use a syringe. A standard hydrometer syringe with the hydrometer removed is suitable. The electrolyte in a fully-charged cell of the vehicle type should have a specific gravity of 1.270 to 1.280, although the battery will continue to give good service between the limits of 1.250 and 1.300. If the specific gravity of the electrolyte in any cell is higher than 1.300 it should be reduced. If lower than 1.250 the cause should be promptly investigated and corrected.

During discharge the gravity of the electrolyte becomes lower on account of a portion of the acid in the electrolyte being combined in the plate in producing the current. Thus, at the finish of a normal discharge, the electrolyte is 100 to 150 points lower than at the beginning. When the battery is recharged the acid will be returned to the electrolyte and will restore it to the former gravity.

CANADIAN MARCONI CO.'S REPORT

Ninety-three steamships of Canadian register are equipped with the Marconi system according to the annual report of the Marconi Wireless Telegraph Company of Canada. The company also operates a total of forty stations in the Dominion, in Newfoundland and in Labrador. An installation for high-speed transmission has been made at Glace Bay and the Louisburg trans-Atlantic station has been completed and placed in operation.

REPORT ON TIME SIGNALS

The annual report of the United States Naval Observatory calls attention to the importance of the wireless time signals which it sends out. The report relates that a merchant ship steaming out of New York checked its chronometers every day by means of the signals sent out from Arlington until it had reached a point 600 miles north of Rio Janeiro, which is 4,250 miles from the government station. The mean daily error in transmission during the last fiscal year was 0.055 second, and the maximum error 0.36 second, due to a change of rate in the standard sidereal clock in consequence of overhauling. Among watchmakers, jewelers and colleges the number of sets in use for receiving time signals has increased considerably. It is pointed out that there is a difference of time between the transmission of the signal and its arrival at a point which sometimes amounts to 0.3 second. The Observatory wants an appropriation from Congress, declaring that the increased employment of the signals for astronomical and other purpose requiring a high degree of precision makes more efficient sending apparatus desirable. Attention is also called to the fact that a system of return signals should be arranged in order to ascertain the exact time of the receipt of signals.

SIGNALS FROM BOTH SIDES

J. H. A. Lendorf, Marconi operator on the Zeelandia of the Dutch Lloyd, on a recent voyage received the Arlington time signals on five successive nights at distances of more than 3,000 miles, the distance on one occasion being 3,413 miles. On another occasion signals were received from Eiffel Tower and four hours later from Arlington. Lendorf used a Marconi universal crystal receiver.

本社東京特電

○日布間無線電信通信成る

二月三日午後七時本社着
本社着—野澤枕城發

曩にマルコニー無線電信會社は無線電信にて世界一周連絡を計劃し當地の陸上局も大に改築し新に最新式パウルゼン裝置を施して日本と布哇との間の連絡通信を爲さんとして遞信省と協議を重ね極力日布間の通信に勉め日夜其の試驗中なりしが遂に北海道落石無線電信局にては當嶋カフク局より發せる通信を明確に感受し爲に茲に海上三千五百哩の日布間通信交換の新記錄を作り多年の功空しからず愈其の實を擧げ得べき端緒を開くことを得たり

Connection to Japan Made Over Pacific

ACCORDING to prominent business interests in Honolulu, the name preferred for the Hawaiian Islands above all others is "The Crossroads of the Pacific." Full justification of this alluring sobriquet was earned on February 2 when the western Pacific Ocean was bridged by messages from the Kahuku station of the Marconi Company, received and clearly read by the Japanese government station at Ochiishi, Hokkaido, Japan.

It was about 9:30 o'clock when the Japanese night operators first heard the Hawaiian messages, spanning a distance approximately 3,400 miles.

On this page is reproduced the report of the achievement as it appeared in a Japanese newspaper, "The Shinpoo," and which may be freely translated in part as follows:

"Tokyo, Japan, Feb. 3.—Some time ago the Marconi Wireless Company planned to put up around-the-world connections with the local stations having the latest type equipments and has been earnestly endeavoring, day and night, to exchange messages between Japan and Hawaii, after having several conferences with the Department of Communication. Ochiishi station (in Hokkaido) has at last succeeded in receiving messages sent from Kahuku station, very distinctly. This has made a new record of oversea messages between Hawaii and Japan (3,500 miles). Many years of experiment has thus not been fruitless and the way has now been opened for its realization."

Prior to catching the signals of the Hawaiian stations, oversea messages were being received in the Ochiishi station from the Pacific Mail liner Manchuria, 1,100 miles off the Japanese coast and bound for Honolulu. The Ochiishi operators declared that the messages from the Marconi Hawaiian station were clearer than those from the steamship, despite the fact that the distance was more than three times as great. The communication lasted for about an hour.

IN THE SERVICE

CONTINENT-TO-CONTINENT DIVISION

Howard E. Campbell, engineer at the Marconi trans-oceanic station at New Brunswick, N. J., was fifteen years old when he finished his first year at high school. Then, seized with a desire to see something more of the world than the scenes of his native place provided, he ran away from his home in Greenup, Ill. Two years passed before he returned to Greenup, in the course of which he concluded a course in railroad telegraphing at Janesville, Wis. He next entered the high school at Bloomington, Ind., completing a four years' course in two years.

The scientific and engineering course in Indiana University appealed to him as a further means of education, but lack of funds stood in the way of carrying out his plans. This did not long deter him, however, and in 1906 he enrolled as a student at the University. For two years he devoted himself to his studies, but at the end of that time he was compelled to abandon his University course because of trouble with his eyes.

Campbell, disappointed because of the ill-fortune which had prevented him from following out his ambitions, then determined to seek knowledge in travel, enlisting as an electrician in the United States Navy. He was sent to the Brooklyn Naval Electrical School, where he received elementary instruction in wireless engineering and operating, after which he was detailed as wireless operator and general electrician on the flagship of Rear Admiral Osterhaus, of the Atlantic fleet. At his own request Campbell was afterwards transferred to the torpedo boat destroyer Walke. During his service on the destroyer the latter was driven out of her course by storms and compelled to put in at Bermuda for a general overhauling.

While in port the captain of the Walke asked Campbell to install a 2 k.w. quenched spark set. This task Campbell, with the assistance of the ship's carpenter and blacksmith, successfully completed. Excellent long distance results were obtained by means of this set and the Walke was chosen to handle all traffic between the flotilla and the Commodore's flagship.

Campbell spent eighteen months at sea, obtaining an honorable discharge in the spring of 1912. He then became an employee of the Corinth Light and Power Company, in Corinth, N. Y., but attracted again by the fascination of wireless, he entered the service of the American Marconi Company in the winter of 1912. Not long after he had become a Marconi man he installed a set on the sealing vessel Neptune of St. Johns, N. F., incidentally becoming acquainted with Captain Bartlett, known to the world because of his connection with Arctic explorations. During his service with the Marconi Company Campbell has been in charge of special tests and has acted as labratory assistant and inspector. He has occupied his present position since Henry E. Hallborg left the New Brunswick station to enter the United States Government service as expert radio aid.

The War Incidents

ANOTHER instance of the effective use to which wireless telegraphy has been put in the European war is provided in accounts of the depredations of the German converted merchantman Prinz Eitel Friedrich which reached Newport News, Va., recently, after she had spent seven months in harrying the sea commerce of her enemies. She steamed out of Tsintao last September, crossing the Pacific, rounding Cape Horn and making her way up the Atlantic. In the course of the voyage she sank eleven ships, including the American sailing vessel William P. Frye.

The Eitel Friedrich passed out through the Japanese Islands, eluding a number of British, French and Japanese warships. Her first capture was the English steamship Charcas, which was taken off the Chilean coast. Then the sea rover encountered the French sailing ship Jean. The latter was towed to Easter Island where the people from the Charcas, the Jean and the English steamship Keldaon, overtaken and destroyed en route, were landed. Afterward the Eitel Friedrich steamed down the Chilean coast to Cape Horn, and made her way up the Atlantic. The Russian bark Isabella Brown next fell into the clutches of the German craft, and the William P. Frye and the French bark Jacobsen encountered the same fate. Thus the raider steamed on, the Indradoe, the Mary Ada Short, the Floride and the Willerby in turn being among her victims.

The navies of the Allies have been described as making persistent attempts to locate the Eitel Friedrich, but without success. The success of the raider in eluding craft of the Allies was doubtless due in a large measure to the fact that she employed her wireless to keep her officers informed regarding the positions of other ships.

When the Eitel Friedrich was off the coast of Chile near the point where Admiral Craddock's ships engaged in battle with the German squadron, the wireless

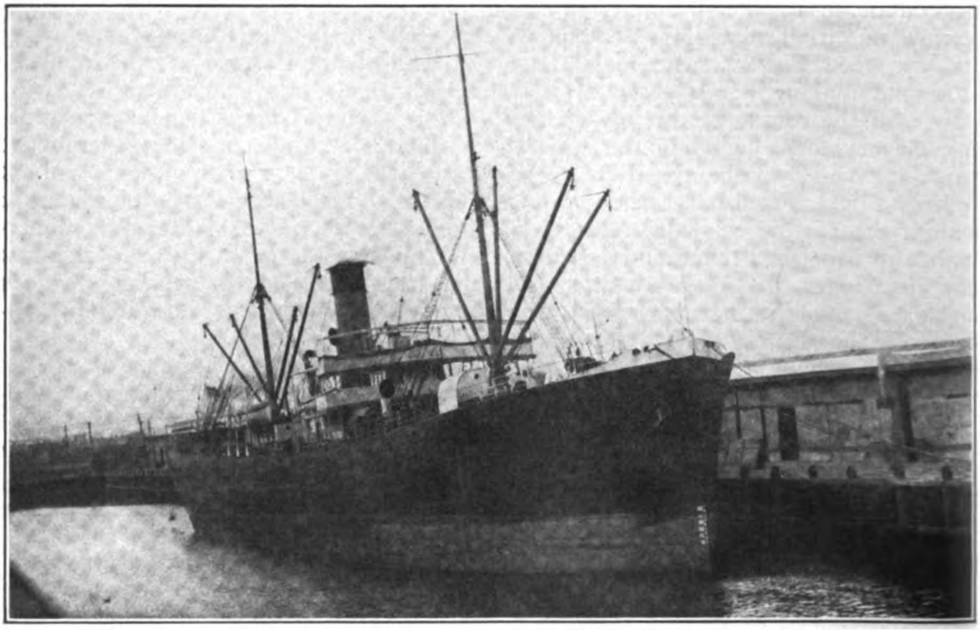
The wireless station in the fortress of Przemysl, the Austrian stronghold which finally fell before the Russian onslaughts after nearly seven months of almost continuous siege

of the raider brought news of the encounter. After she had rounded Cape Horn she heard by means of wireless of the battle off the Falkland Islands.

The Friedrich did not molest any ships for two weeks before reaching Newport News, because of her commander's wish to avoid any possibility of betraying her position to British cruisers. When she neared the Virginia capes her wireless operator received information that there were four English warships nearby. The German craft eluded them, however, and made her way safely into port.

Operators M. W. Grinnell and A. E. Ericson, of the American Marconi Company, who were detailed on the City of Macon when she steamed from this country recently, bound for Bremen, Germany, underwent an eventful experience, having been arrested as suspected spies and imprisoned. When the steamship arrived near the mouth of the River Weser the wireless men took several photographs, among the objects which they snapped being a torpedo boat destroyer and a floating mine. While the Macon was steaming up the River Weser they also photographed an aeroplane which was soaring above the vessel.

They were considerably surprised a short time afterward when the vessel was boarded by German officers and they were placed under arrest. Their explanations not being satisfactory, their camera and photographs were confiscated and they were taken from the vessel and locked up. It was not until several days later, after their stories had been thoroughly investigated, that they were released.



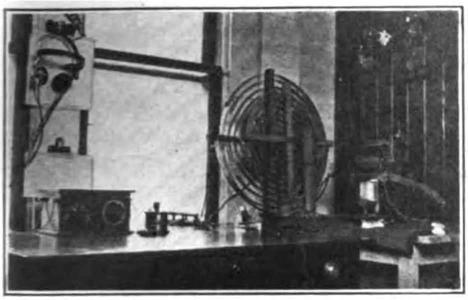
The Dacia, formerly a Hamburg-American liner, transferred to the American flag and Marconi equipped after the outbreak of hostilities, as she appeared when seized by a French cruiser

Fritz Kleist, a Marconi operator, has been held as a prisoner of war in Hong Kong since the outbreak of the European war. Kleist joined the Marconi service in 1912 and was sent to San Francisco in 1913. He was in charge of the wireless equipment on the steamship Manchuria which arrived in Hong Kong on August 10th last. Kleist's arrest followed the arrival of the Manchuria. He has written to The Wireless Age, saying that "after my release from here, which I hope will be soon, I am going back to San Francisco to join the Marconi Company again."

With the Amateurs

The Central Radio Association, recently organized with the object of cementing closer relationships between the amateurs of the states lying between the Ohio and the Rockies, reports an enthusiastic reception throughout its territory. The secretary, H. B. Williams, of Chanute, Kans., is desirous of obtaining call letters and descriptions of all amateur stations in the district.

At a recent meeting of the Colorado Wireless Association, of Denver, W. S. Lapham was elected president; H. O. Whitman, vice-president; M. Anderson, secretary; E. S. Stockman, treasurer, and W. H. Smith, chief operator. The association has now secured permanent quarters on the top floor of the Y. M. C. A. building and erected an aerial 400 feet long with an average height of 150 feet.



The spark gap in the Simsons' station is mainly made up of a condensed milk can, a broken phonograph record and ingenuity

A. Gail Simson and Lloyd H. Simson, of The Dalles, Ore., announce their longest receiving records as Key West and Panama, with the 1 k.w. station shown in the photograph. In the upper right hand on this picture may be seen a telegraph sounder used as a buzzer on party line (110 volts through lamp resistance). There are no switches in the hook-up, as the sounders are in multiple. Other details of the station are described thus: "Just below, and on the condenser, is a 1 k.w. Thordarson transformer. The condenser consists of five plates of window glass 22 x 24 inches, coated with tinfoil sheets 18 x 20 inches. The oscillation transformer is of 1 inch copper ribbon (10 turns secondary, 7 turns primary) mounted on inch square hickory rod.

"After much experimenting we found that a water cooled spark gap was the only straight gap we could use with any degree of efficiency. We constructed it of the following materials: A five cent condensed milk can (the lid bent back for a tab), a blown porcelain fuse, an elevator contact for the other electrode, part of a broken disc phonograph record, and a couple of insulators. It is a gap that anyone can afford and one that is an improvement over the old straight gap.

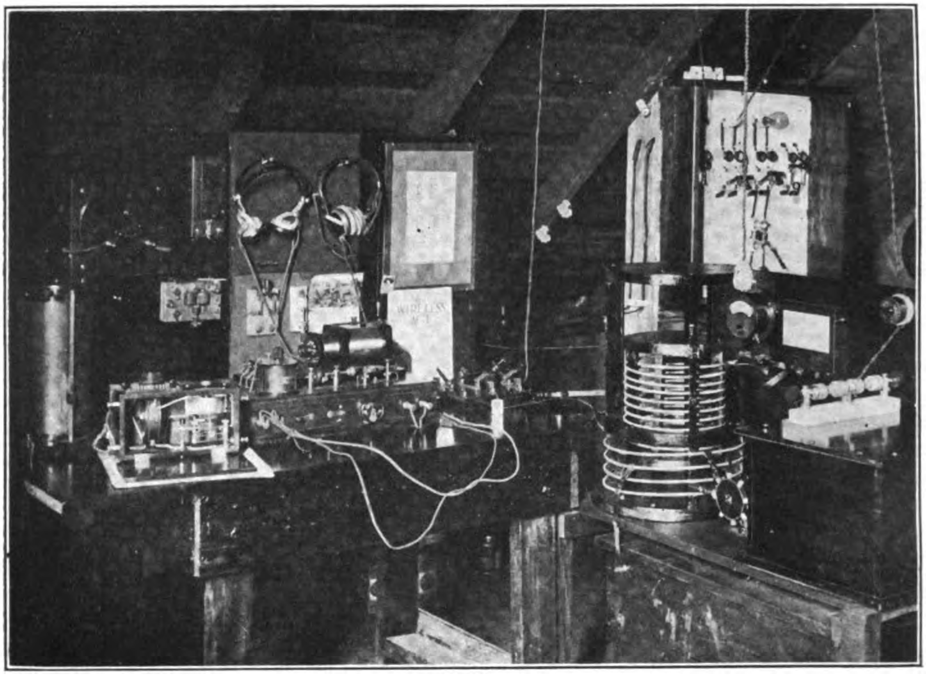
"For receiving we have a Murdock variable condenser, Clapp-Eastham receiving cabinet and Brandes Trans-Atlantic phones. We do *not* use a ferron detector. We have tried ferron, carborendum and galena, but have found for sturdiness combined with sensitiveness that silicon is superior.

"Our aerial is composed of two cables of 4-strand phosphor-bronze (No. 20) on 20-foot spreaders. The aerial is of the inverted "L" type, 685 feet long, 100 feet high, grounded on water pipes, buried wire netting, bundles of wire and copper boiler bottoms.

"Owing to our being so far from commercial stations we were granted a license in spite of our long wave length."

J. Arthur Evans, of Richmond, Va., has both telegraph and telephone connections in his station, and has it wired with a code practicing device for four. The station as it stands to-day is the result of three years' experimenting.

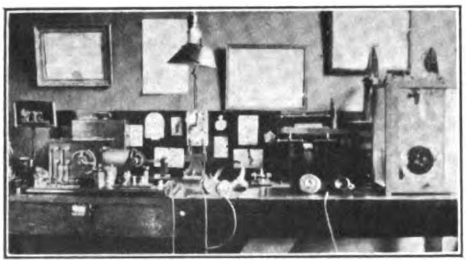
The receiving set, comprising essentially a navy type receiving transformer, trans-Atlantic phones, variable and fixed condensers, perikon and galena detectors, and pole changing switches, is mounted on a mahogany panel. Be-



William C. Miller of Bushnell, Ill., has raised the efficiency of the pictured transmitting set through Wireless Age *articles*

hind the loose coupler may be seen a case containing a portable receiving set.

The transmitter consists of a 1 k.w. transformer, plate glass condenser, with oscillation transformer mounted above, rotary gap in glass case, straight



A code practicing device for four is a useful addition in the station of J. Arthur Evans

gap on top, heavy key and commercial type antenna switch.

The station is situated on a bluff, towering three hundred feet above the James River and the surrounding country. The aerial, 60 feet high and 135 feet long and consisting of four 7-22 phosphor bronze wires on 18-foot spreaders, and thus favorably located, is specially efficient.

In Bushnell, Ill., William C. Miller's amateur equipment has a reliable receiving range of from 800 to 1,000 miles and 105-mile transmission to his credit under fair conditions. The character and arrangement of his apparatus are well displayed in the accompanying illustration.

Plans to promote a state-wide association of amateur organizations were made at the annual meeting of the Wireless Association of Pennsylvania, recently held in its headquarters at 200 North Fifteenth street, Philadelphia. Since its organization in 1910 this association has confined its activities principally to the city of Philadelphia and its immediate vicinity. Under the direction of a committee other clubs will be invited to cooperate in the new plan of expansion.

Archibald Thomas, a member of the leper colony on Penikese Island, who kept in touch with the outside world by means of wireless telegraphy, died recently. He was twenty-five years old.

A Few Words to the Wise

APPLICANTS for first grade wireless license certificates should have far-reaching knowledge when they visit the United States Navy Yards nowadays to take the examination. This conclusion is based on the fact that those in charge of compiling the questions have included queries regarding pieces of apparatus which are not in use by commercial wireless telegraph companies. As a result, the prospective holder of a First Grade License, who has informed himself concerning the elements of electrical engineering, is called upon to describe a piece of equipment which, from an electrical viewpoint is simple, but from the mechanical standpoint is extremely complicated. Thus, unless he has a keen appreciation of perspective and is also skilled in mechanical drawing he is likely to find himself confronted with problems which apparently cannot be solved.

Reference is made to the query which asks the applicant to describe fully and show by a detailed drawing the construction and operation of an alternating current circuit breaker.

A sketch of the Roller-Smith overload circuit breaker which, except as regards calibration, is correct for either direct or alternating current, accompanies this article. It should be stated at the outset that we have no knowledge of any commercial company which employs circuit breakers on their commercial marine wireless equipments.

A description of the apparatus is as follows: As per the diagram (Fig. 1), a heavily copper-plated rectangular core, A, journaled on the cylindrical shaft shown, is supported by the latter, between two non-magnetic supporting frames, one of which, B, is visible in the cut, the other of which is, of course, not shown because the view is a sectional one. To this rectangular core there is secured the terminal of a laminated winding formed of a plurality of hard-rolled copper strips, C, and also the arm, D.

The arm, D, has riveted to it the heavy cross plate, E, against which in turn bear the fingers of the laminated brush, F, which forms a stationary main current carrying member of the device. The strong outward pressure exerted by the brush, F, on the arm, D and E of the circuit breaker in the position shown tends to throw the device open. This tendency is assisted to some extent by the resiliency of the windings forming the coil, C, which are always striving to assume their initially straight form.

The arm is restrained from so opening by the mechanism formed by the rollers, G and H, and the housing, I, which is pivoted at J. This follows because the dimensions are such that with the handle on the circuit breaker pulled down to its lowermost limit a straight line joining the center of the bearings of J and G, falls just below the center of the bearing of H, from which it is clear that the outward pressure of the brush tends to force the roller, H, up and consequently the handle down. This they are not free to do because of the stops which are provided.

For causing H to roll over the center just described when there occurs a load in excess of that for which the breaker is set, there is provided the copper-plated iron armature, K. This armature is of the inverted U shape, when viewed facing the breaker, the letter K being in the cut at the lower extremity of one leg. The other leg is symmetrical, but is not shown, in view, being a sectional one.

The cross member of the U is shown in the section at L and the armature as a whole has integrally attached to it a heavy finger, M. The armature is free to swing on a pivot, N, and carries a pointer, O, which moves over the calibrated scale, thus enabling the setting to be readily observed. Appropriate stops limit the travel of the armature in each direction, one of them being adjustable so as to enable the distance between the upper face of the legs, K, and the lower face of the square core, A, to be varied at will.

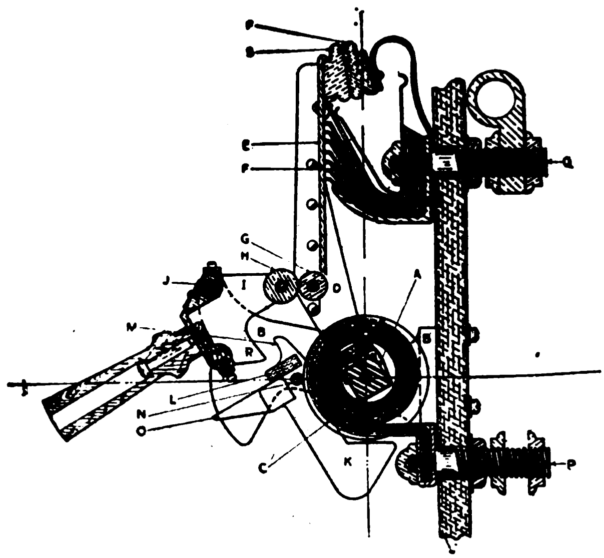


Fig. 1

When the preceding explanation is understood the operation of the circuit breaker becomes obvious. Current entering through the lower studs flows through the laminated strap winding, C, and thence into the arm, D, through the contact plate, E, into the stationary brush, F, and finally out through the upper stud Q. In its passage through the laminated winding, C, the square core, A, is, of course, magnetized to a degree dependent on the current strength. When this magnetization reaches a predetermined value the attraction exerted on the ends, K, of the pivoted armature causes the latter to rise with great and increasing velocity, finally bringing the finger, D, which forms part of the armature into violent contact with the face, R, of the corresponding projection on the housing which carries the handle and the roller, H.

This heavy blow, of course, causes H in its rotation about the shaft, J, to go over the center, and consequently allows the strong outward pressure of the brush, F, and the resilient coil, C, to throw the arm outward with a high velocity and so break the circuit, first between the brush fingers and the contact plate and finally between the carbons, F and S, one of which is rigidly secured to the arm, and the other resiliently mounted on its supporting spring. To reset the breaker the handle which the act of opening has raised is pulled down, thus bringing the roller, H, into engagement with the roller, G, once more and in that way forcing the arm back into its initial position.

The circuit breaker, therefore, takes the place of the fuse with the exception that unlike the latter, when it has performed its function, it is again operative.

The circuit breaker may be simply defined in the following manner: It is a device for automatically opening an electrical circuit when the current in that circuit has risen above a certain predetermined value. An electro-magnet connected in series with the main line circuit has an armature which operates on a trigger. The trigger when pulled releases a larger arm which carries the main contacts for breaking the circuit. This arm is held in position against the pulling action of a heavy spring. When more than the number of amperes for

which the circuit breaker is adjusted, flow through this magnet, the trigger is pulled and the main line contacts are forcibly opened to prevent arcing. The separating arms of the circuit breaker carry carbon contacts as well as copper strips, the copper strips separating first at the break, and the carbon contacts last. The circuit breaker may be explained in an elementary manner with the aid of Figure 2. Here the source of energy is a direct current armature marked DC; an energy absorbing device is represented by the load, B. The circuit breaker is represented by the winding, S, the plunger, T, the movable arm, M, and the stationary contact M-1. When the current flowing from the generator, DC, exceeds a certain value the magnetic flux acting on the plunger, T, becomes of such intensity as to draw the contact, M, away from the contact, M¹, M being held in the open position by a large spring shown in the drawing.

It is not intended that this simple circuit diagram should in any manner represent the mechanical actions of a circuit breaker. It is intended only to clear up the function of the instrument as a whole. Many of the important mechanical considerations have been entirely left out.

The applicant for the government certificate is often asked in his examination to give a detailed explanation of the Edison storage cell. The following statement is not intended to be a discussion of the relative merits of the lead cell and the Edison cell, nor in any sense a reflection on the latter, but we might advise that not a single cell of the Edison type is in use commercially by the Marconi Company. However, certain ship installations of the United Fruit Company have a set of Edison storage cells for supplying energy to the motor generator in case of emergency.

In distinction to the lead cell which employs an acid electrolyte, the Edison cell has an alkaline solution consisting of a 21 per cent. solution of potassium hydrate mixed with a small amount of lithium-hydrate.

The positive or nickel plate consists of one or more perforated steel tubes, heavily nickel-plated, filled with alternate layers of nickel hydroxide and pure metallic nickel in exceedingly thin flakes.

The tube is drawn from a perforated ribbon of steel, inckel-plated, and has a spiral lapped seam. This tube, after being filled with active material, is reinforced with eight steel bands, equidistant apart, which prevent the tube expanding away from and breaking contact with its contents. The tubes are flanged at both ends and held in perfect contact with the steel supporting frame or grid made of cold rolled steel, nickel-plated.

The negative or iron plate consists of a grid of cold rolled steel, nickel-plated, holding a number of rectangular pockets filled with powdered iron oxide. These pockets are made of very finely perforated steel, nickel-plated. After the pockets are filled, they are inserted in the grid and subjected to a great pressure between dies which corrugate the surface of the pockets and force them into practically integral contact with the grid.

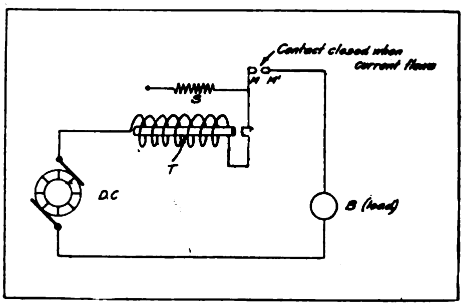


Fig. 2

An important feature in connection with the Edison cell is that the density of the electrolyte does not change on charge or discharge; consequently hydrometer readings are unnecessary. Another important feature is that no acid fumes are given off during the charge.

The normal average charging rate of an Edison cell as compared to a lead cell of the same capacity, is much higher, and the battery will stand a very much higher charging rate than lead for the reason that the higher temperature incident to a heavy charging rate, such as is used when necessary to charge a battery hurriedly, does not soften the active material in the plate, whereas, in the case

of the lead battery it may result in rapid deterioration.

For charging purposes it should be of interest to know that although the normal voltage of the cell is 1.2 volts the charging voltage for the cells should be 1.85 volts per cell. The following table will, therefore, be found useful:

24	cells require a line voltage of	45	volts
28	" " " " " "	52	"
32	" " " " " "	60	"
36	" " " " " "	67	"
40	" " " " " "	74	"
44	" " " " " "	82	"
48	" " " " " "	90	"
52	" " " " " "	96	"
56	cells require a line voltage of	104	volts
60	" " " " " "	111	"

etc.

When the voltage of a given cell drops to .9 it should immediately be placed on charge.

When the DC voltage is higher than named for a given number of cells, a resistance of some sort must be inserted in series with the cells on charge in order to reduce the voltage to the required point.

It is hoped that the foregoing data will be of assistance to those who contemplate taking the United States License examination in the near future.

WIRELESS IN HAMILTON

Officers of the Hamilton Radio Association. From left to right: Shuler Doron, secretary and chief operator; Arthur Letherby, vice-president; Hughes Beeler, president, and Cecil Hopkins, treasurer

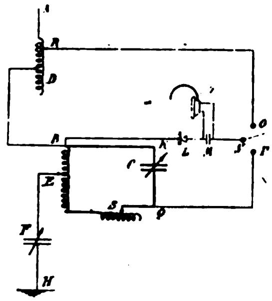
An organization known as The Hamilton Radio Association was formed recently in Hamilton, Ohio, with forty local amateur operators out of a possible hundred attending the first meeting. Hughes Beeler was elected president; Arthur Letherby, vice-president; Shuler Doron, secretary and chief operator; Cecil Hopkins, treasurer.

The private wireless station owned by Shuler Doron, on Prospect Hill, works under a commercial license with a clause making it a government station in time of emergency. Its sending range is said to be 500 miles, and messages have been received up to 2,500 miles. Cincinnati, Dayton, Indianapolis, Sandusky, Cleveland, Columbus, and Duluth, Minn., are within easy access. Messages from Arlington, Key West, Colon, and Sayville, are regularly picked up.

The majority of the members of the association have already passed the first grade examination and obtained licenses.

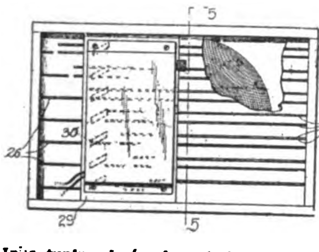
RECENT PATENTS

1,129,821. WIRELESS TELEGRAPHY. LOUIS TRONCHON, Paris, France, assignor to Compagnie Generale Radio-Telegraphique, Paris, France. Filed Dec. 6, 1912. Serial No. 735,329. (Cl. 250—8.)



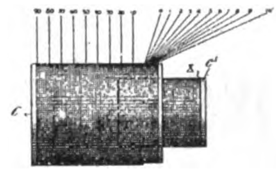
The process of eliminating the effects of several disturbing stations at a radio-telegraphic receiving station and of simultaneously adjusting the receiver for efficient reception which consists in listening in over a tight coupling so as to detect all frequencies received, simultaneously offering to the passage of the currents the large resistance produced by a slightly damped circuit loosely coupled to the receiving circuit and tuned to the frequency of the waves which it is desired to receive by adjusting such circuit until the energy of the desired frequency which reaches the telephone over the tight coupling becomes a minimum, and then listening in over the loose coupling.

1,127,738. TUNING DEVICE FOR WIRELESS-TELEGRAPH SYSTEMS. ALLEN J. COUGHENOUR, Fort Leavenworth, Kans. Filed Jan. 24, 1914. Serial No. 814,212. (Cl. 171—119.)



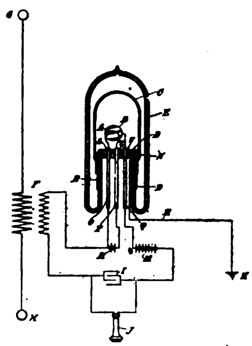
1. In a tuning device for wireless telegraphy systems, a variable inductance coil including a plurality of wire conductors, each provided with a coil, said coils being arranged in nested relation, and a switch including a base, a plurality of conductors mounted upon said base and arranged in parallel pairs, the ends of each wire being connected to the contiguous conductors in adjacent pairs, contact members arranged upon the base in opposed relation to each pair of conductors and spaced therefrom, a wire connecting the contact members together and adapted to be grounded, and a switch member mounted for rectilinear movement over the switch base and provided with a plurality of circuit closing members, said members being arranged in coöperative relation with the conductors and contacts upon the switch base whereby the movable switch member may be positioned to engage any one of said circuit closing members with one of the conductors and the opposed contact to close the circuit, certain of the other circuit closing members being engaged with the respective pairs of conductors to include in the circuit a predetermined number of the inductance coils.

1,127,921. APPARATUS FOR RADIO COMMUNICATION. GREENLEAF WHITTIER PICKARD, Amesbury, Mass., assignor to Wireless Specialty Apparatus Company, Boston, Mass., a Corporation of New York. Continuation of application Serial No. 461,617, filed Nov. 9, 1908. This application filed Apr 24, 1913. Serial No. 763,408. (Cl. 250—40.)



1. In an apparatus for radio communication, means for tuning to resonance by inductance variation, a high-frequency oscillation-circuit of a receiving station, which comprises a high-frequency inductance coil consisting of many turns of wire arranged around a non-magnetic core and closely adjacent to each other successively to provide maximum self-induction and wave-length-range for minimum distance between the ends of the coil; in combination with a switch-panel arranged alongside said coil; switch-connectors mounted on the same side of said panel as said inductance coil; two switches with their contacts, mounted on the other side of said panel, the arms of the switches being adapted for connection with the high-frequency circuit to be brought to resonance, and the switch-contacts being connected with said switch-connectors on the coil-side of the panel; intervening connectors mounted on the coil-side of said panel; leads connecting the switch-connectors with said intervening connectors, and leads or taps from said intervening connectors to said inductance coil; the connections and taps from the switch-contacts of each switch to the coil being of limited number and thereby avoiding serious parasitic currents, by means of an arrangement consisting in making the connections from the switch-contacts of one switch, only to points of the coil which are separated by relatively large portions of the coil, over a portion of the coil up to a definite intermediate point, and in providing for smaller adjustments by making the connections from the switch-contacts of the other switch to points of the coil beyond said intermediate point which are separated by relatively small portions of the coil; and means for connecting said fixed point of the coil intermediate the large and small subdivisions thereof, with both said switch-sets, whereby they both coöperate to cut into the high-frequency circuit to be tuned, large and small units of inductance on opposite sides of said fixed intermediate point of zero inductance in circuit.

1,128,817. VALVE-DETECTOR FOR WIRELESS. GREENLEAF WHITTIER PICKARD, Amesbury, Mass., assignor to Wireless Specialty Apparatus Company, Boston, Mass., a Corporation of New York. Filed July 3, 1912. Serial No. 707,616. (Cl. 250—27.)



1. A rectifier detector of the Edison-effect type, which comprises hot and cold terminals and an electrically conducting sheath substantially completely surrounding the same.

From and For those who help themselves

Experimenters' Experiences.

The Editor of this department will give preferential attention to contributions from amateurs covering the design of transmitting sets, wave-meters, etc. There is an over-supply of material on receiving tuners, particularly "loose-couplers," the designs for the majority of which present nothing new or original.

FIRST PRIZE, TEN DOLLARS

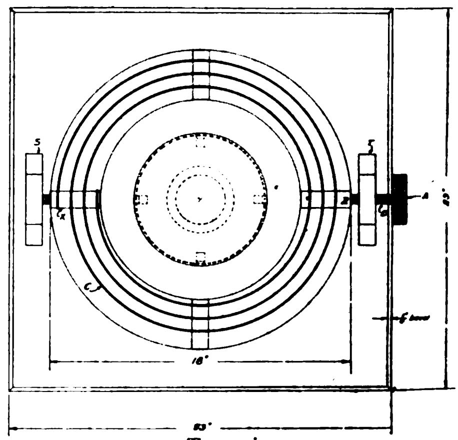
An Oscillation Transformer

The amateur experimenter, when constructing his transmitting equipment, is apt to be more or less neglectful in the design of the oscillation transformer, and as a result a wave may be emitted from the set which does not fully comply with the United States regulations. I consider my design unique in that it allows the degree of coupling between the primary and secondary windings to be adjusted with facility, affording such values that the emitted wave will meet all requirements.

The two windings are not wound exactly parallel to one another, the primary winding being made in the form of a large clock spring and the secondary winding being a helix of ordinary design.

The complete transformer is constructed as follows: As a support for the primary winding, secure a round ring of one-half inch wood, having the dimensions shown in Fig. 4, namely, outside diameter, eighteen inches; inside diameter, twelve inches. Next obtain four pieces of black fibre, 1 x 1 x 3 inches. These should be slotted to receive the copper or brass ribbon, which constitutes the primary winding. The fibre supports are then placed equidistantly around the wood ring by means of brass screws.

In the piece of fibre marked X, in Figs. 1 and 2, drill a ½-inch hole about ½-inch in depth to receive a round fibre rod, ½ x 1½ inches, which is to act as a bearing. This may be fastened in place with glue. Do the same with the piece marked Z. In this case the size of the fibre rod is ½ x 3½ inches and is threaded at the end to receive the handle marked A. The primary winding is now put in place; it consists



Top view
Fig. 1, First Prize Article

of three turns of 1 x 1 1/16-inch ribbon.

The secondary winding is of the

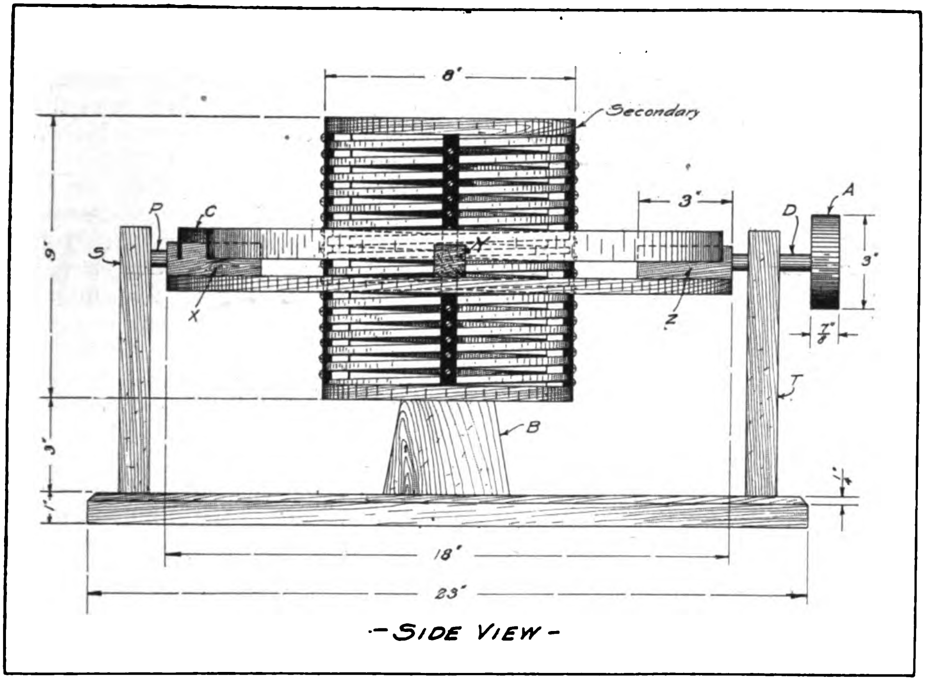


Fig. 2, First Prize Article

plain helix type, 8 inches in diameter by 9 inches in height. It is wound with sixteen turns of ¼ x 1/16-inch copper or brass ribbon and each turn is spaced ¼ inch from the adjacent one.

In order to improve the insulation of the secondary winding, the ribbon should be put on as shown in Fig. 6, M and N, in Figs. 5 and 6 being two pieces of fibre or hard rubber. The slots in N are 1/16 of an inch in depth and ¼ of an inch in width. The ribbon is first wound in the slots and then M is fastened on by means of brass screws long enough to extend into the wood. This completed, it should have the appearance as indicated in Fig. 6, the white slot representing the copper or brass ribbon.

The primary and secondary windings are now to be mounted on a base or support. The base is made from a piece of 1-inch stock and is 23 inches square, with a ¼-inch bevel on the upper edge. The supports, S and T, are also made from 1-inch stock and cut as in Fig. 3. The hole marked H is drilled half way through on one support, and all the way through on the other. The support for the secondary winding marked B in Fig. 2 can be made either round or square, but should have a slight taper. The handle marked A is made of either hard rubber or fibre, 3 inches in diameter and ⅞ of an inch in thickness.

The woodwork should be treated to match the instruments of the maker's set. The degree of coupling is varied

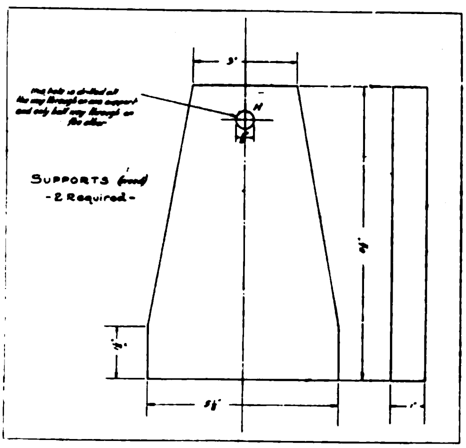


Fig. 3, First Prize Article

by turning the handle as shown; connection is made to the primary and secondary winding by means of clips.

E. C. ERIKSEN, *California.*

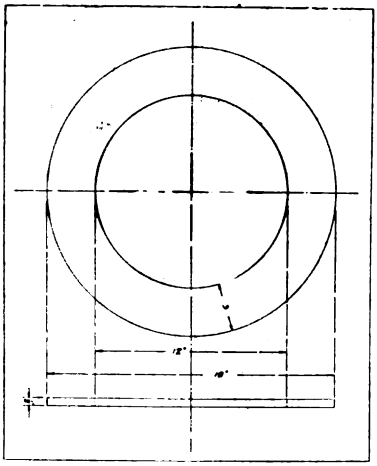


Fig. 4, First Prize Article

SECOND PRIZE, FIVE DOLLARS
An Efficient Method of Wiring a Station

As a regular reader of your magazine, I have read many articles on how to connect up a wireless telegraph set, but as yet I have seen nothing that I

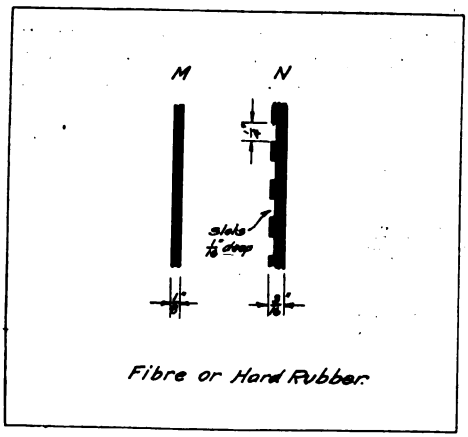


Fig. 5, First Prize Article

believe can come up to the arrangement I am about to describe. The majority of amateur operators prefer to have their transmitting sets in their room, but those using high power transformers have difficulty in muffling the spark, which is very annoying to other persons in the house, especially late at night. This was the difficulty I encountered, so I hit on the following plan:

I transferred my sending set to the attic and by means of a magnetic key and relay, was able to work it from my room downstairs (see diagram). By using the steam pipe for the return wire, only three wires were required to be run from the attic to the room. If a straight gap in place of a rotary gap is employed, only two wires are required.

The advantages of this method of connection are self-evident, for changing the apparatus from a sending to a receiving position and vice versa, requires simply a S. P. S. T. switch which shorts the primary of the receiv-

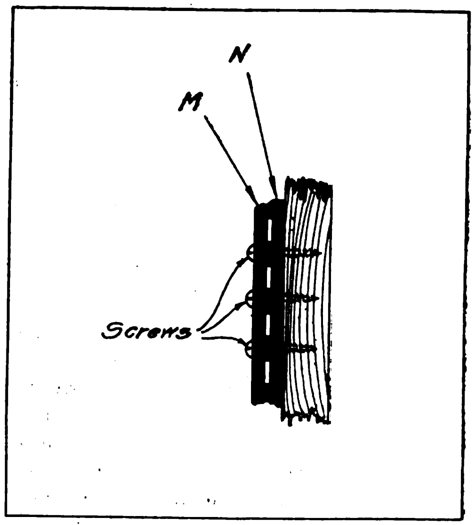
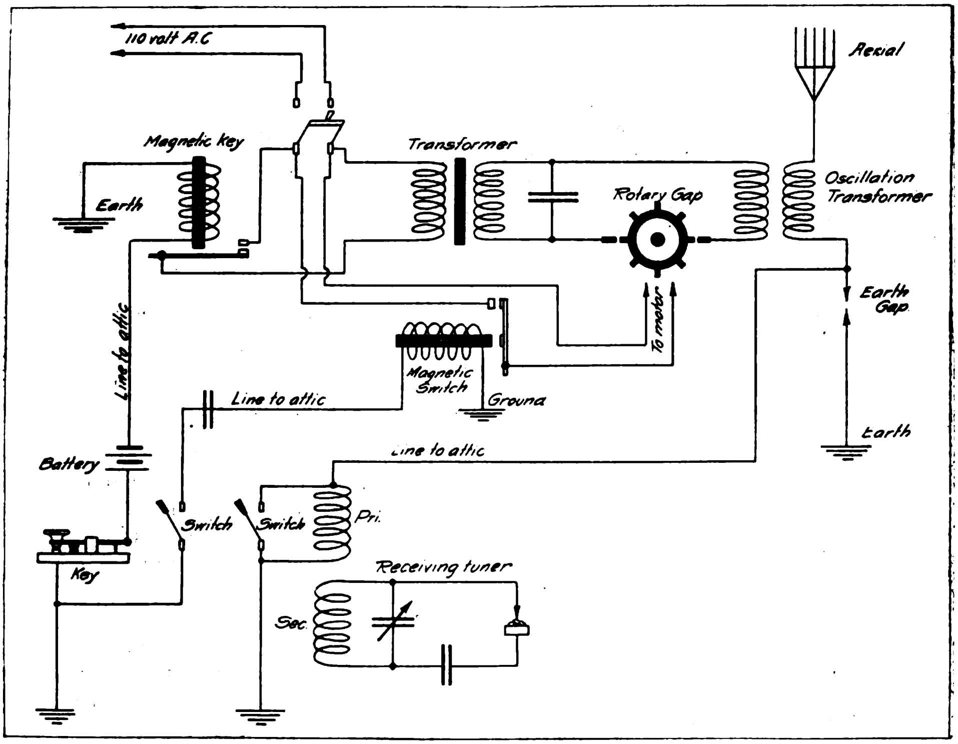


Fig. 6, First Prize Article

ing transformer; the rotary spark gap may be left running while receiving and by means of another S. P. S. T. switch may be started before the other fellow is through sending, so that the rotary gap is at full speed when you are ready to make reply. As stated, the primary winding of the receiving transformer is short-circuited during the period of sending. Since some energy is absorbed by the secondary winding, every dot and dash sent out



Drawing, Second Prize Article

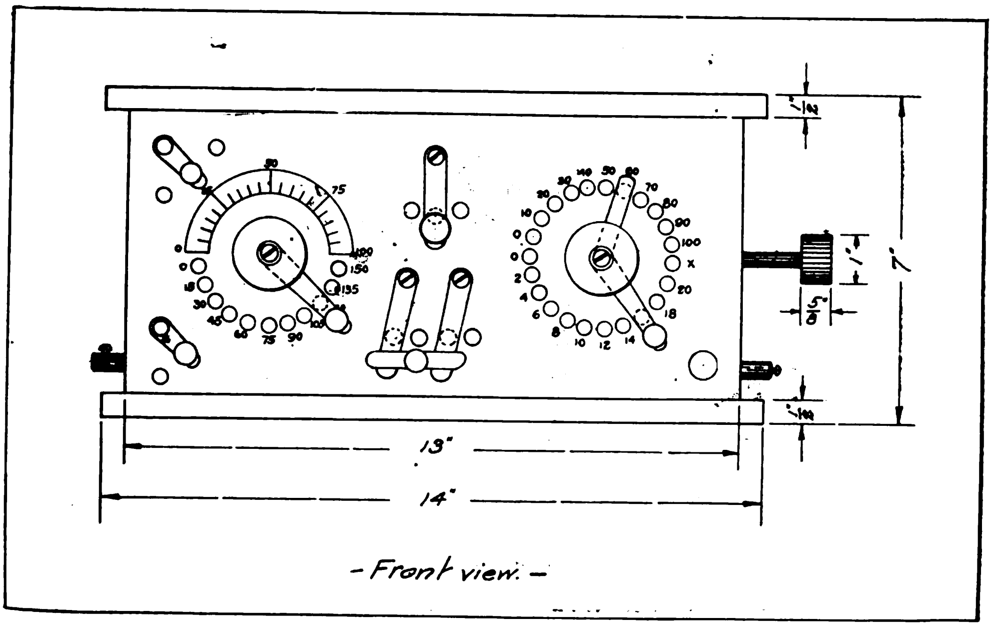


Fig. 1, Third Prize Article

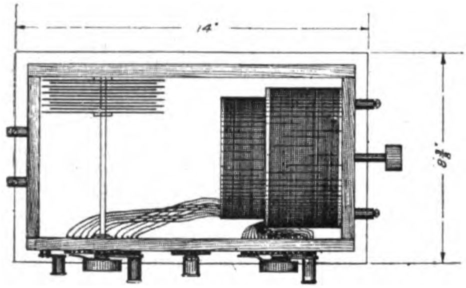


Fig. 2, Third Prize Article

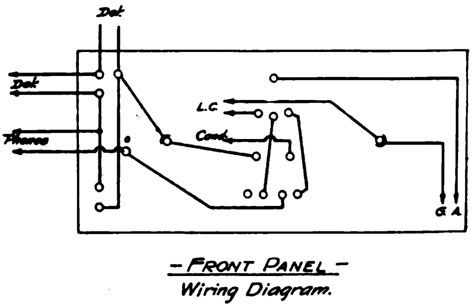


Fig. 4, Third Prize Article

may be read in your own telephone. and besides there is no danger of knockig the detector out of adjustment.

The magnetic key I made from the magnetic of an old telegraph instrument, and an ordinary wireless key. To prevent it from consuming too much current, the relay should be wound to a fairly high resistance, about 40 ohms. Two cells of battery lasted three months on this circuit.

I believe that anyone having an attic or shack in which to place his transmitting appparatus will be more than pleased with this method.

Ferhaps a word or two regarding my sending apparatus may be of interest. For a transformer I use a Packard ¼ k.w. set up in an oil case. The condensers are of the glass straight type. At first I experienced so much trouble with breaking of the plates that I made a case for them and filled it with oil. This destroyed the brush discharge and I now have very little trouble. The rotary spark gap was of my own construction and I soon discovered that by placing sewer points on the wheel, although it gave a lower tone, I secured a spark of considerably

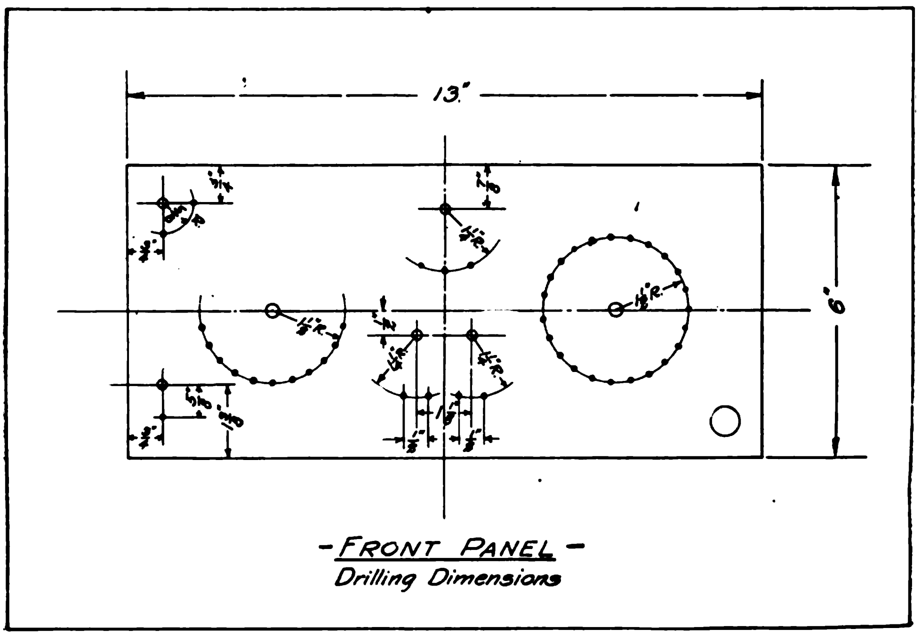


Fig. 3, Third Prize Article

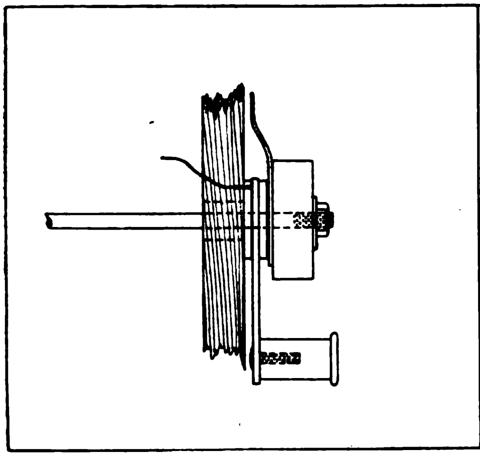


Fig. 5, Third Prize Article

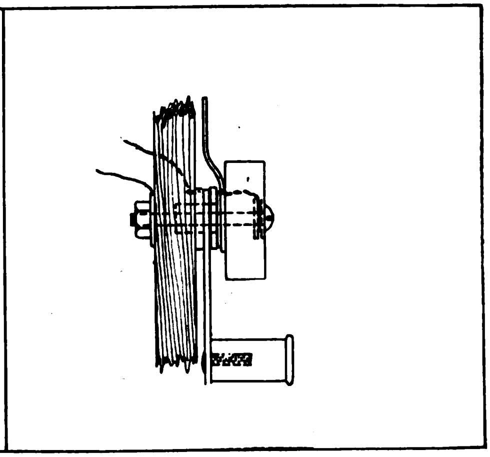


Fig. 6, Third Prize Article

more volume, which enabled me to work longer distances. All the leads of the oscillatory circuit are made of copper ribbon and are as short as possible.

I have done extremely good work with this set and see no reason why all amateurs should not achieve similar results.

JOHN O. ARCHIBALD, *Massachusetts.*

THIRD PRIZE, THREE DOLLARS
A Receiving Set of the Inductively-Coupled Type

I recently designed and constructed a receiving set of the inductively-coupled type which gives excellent results. The construction is not complicated nor the material expensive. The set is also very compact and suitable for portable work, particularly on account of the fact that all parts with the exception of the detectors are on the inside of the case. The adjustments for tuning to resonance are made by the multiple point switches on the front of the case; the coupling is varied by the rod to the right.

The drawings accompanying this article are sufficiently clear for construction, but a brief explanation may assist the elementary experimenter. A front view of the containing case is shown in Fig. 1. The double switch on the right controls the primary winding. The switch, which is turned by the knob, gives "coarse" adjustments of the inductance value, allowing ten turns to be added or subtracted at a time. The second switch, which is turned by the small knob on the end of the lever, connects in two turns at a time. This method of employing the switches allows very close adjustment of inductance values to be attained as the switch may be set on the ten turn tap for the coarse adjustment; then, by turning the lever switch to the right or left, an adjustment within the ten turns either way may be reached.

The lever switch on the left controls the secondary winding, connecting in fifteen turns at a time, while the knob on the left operates the variable condenser. A side view of both of these switches is given in Figs. 5 and 6.

Fig. 2 is an inside view of the case with the top removed. This top is fastened with hinges at the back so that the test buzzer which is placed inside is accessible for repair. The buzzer is operated by flashlight cells which are also placed inside the case.

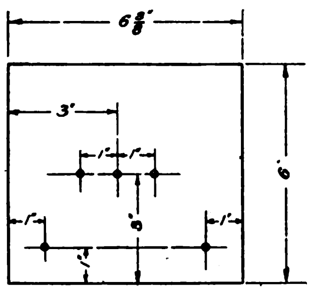
Fig. 3 is a front view, giving the dimensions for drilling. After this piece has been stained it should be drilled from the back and the tap numbers put on with steel dies. The condenser scale can be scratched on with a sharp pointed compass. This is then inked in with a pen and black drawing ink which makes the figures on the scale show up well.

A diagram of the connections is given in Fig. 4; the wire marked "condenser" is connected to the condenser

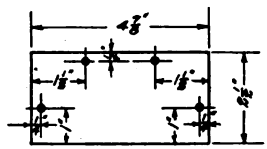
stationary plate.

A detail of the switch for the secondary and the condenser knob is shown in Fig. 5. The rod which goes to the condenser plate is 3/16 of an inch in diameter and extends through a rubber bushing; the latter in turn extends through the secondary switch lever and is insulated from the rod by a washer having a hole 5/16 of an inch in diameter. The washer has a 1/16 inch hole drilled in one side to pin it down and keep it from turning, and also to make connections from this switch.

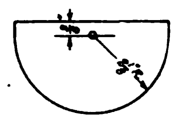
The double primary switch is shown in Fig. 6; it is similar in construction to the secondary switch. The 5/32 inch screw extends through a rubber bushing, which in turn is placed through the lever and a washer, the connection for the lever switch being taken from the washer as in the secondary switch; the connection from the knob switch is taken from a washer under the jam-nut on one end of the 5/32 inch screw. The levers for both switches were made from thin brass, while the contact projection from the knob is made from very thin spring brass.



—FIG 7—



—FIG. 8—



—FIG 9—

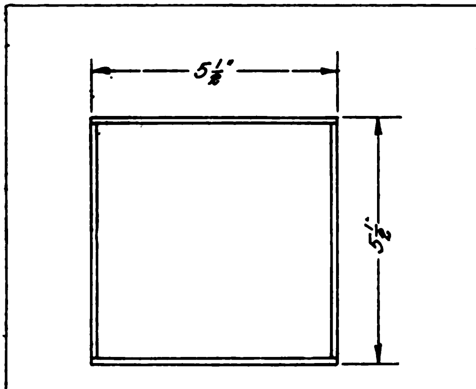
Drawings, Third Prize Article

The sketch in Fig. 7 is laid out for drilling purposes of the end piece through which the rod for varying the coupling enters. Two pieces of 3/16 inch brass rods are screwed into this piece on which the secondary winding slides.

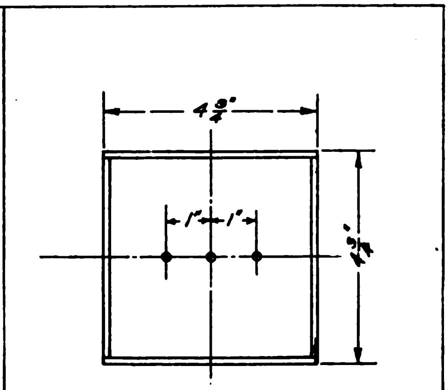
Figs. 8 and 9 are details of the condenser plates. This consists of 6 stationary and 5 movable plates which are separated by washers and kept from touching by use of old but perfectly clean photographic films. The plates for the condenser were made from heavy sheet copper and were cut by a printer on a cutting machine; the round plates were first cut square and the corners then chipped off until nearly round. The plates were finally rounded on an emery wheel and finished with a file. In this way the plates were kept perfectly flat.

The tubes or insulating supports for the primary and secondary windings are shown in Figs. 10 and 11. They were made of cigar box wood thoroughly dried and scraped perfectly clean, each being 3¼ inches in length. The winding should start at the left and a lead of 6 inches left which connects to contact point No. 20. A lead should be taken off every two turns until ten or eleven leads in all have been taken off. This lead then connects to both contact points Number O; a lead is then taken every ten turns until 100 more turns have been included. Contact point X is blank. This contact and also the extra O contact enabled all points to be used without short-circuiting; more plainly, in case 12 or 120 turns were used, the switches would not touch each other by being too close together.

The secondary winding has 150 turns, a lead being taken off every fifteen turns, the connections being each about 15 inches in length. If desired loops could be used for both coils instead of leads, but leads if soldered are



— FIG. 10 —



— FIG. 11 —

Drawings, Third Prize Article

much better on account of their length. Cotton-covered wire was used for the winding and where a lead was taken off, a hole was punched through the tube or box and the wire placed through and taken out from the inside as shown. This construction keeps the wire in place and prevents it from pulling off while making connections.

Any good dry wood will do for the case. I use cherry ½ inch in thickness. Ordinary brass-headed tacks with 5/16 inch heads will do for the contact point. A 1/16 inch hole is drilled for each tack, the wire being put through from the back and wound around the stem; then the wire and tack are both forced into the hole. This makes a fairly tight fit and it is not then necessary to drive the tack in. As the tack projects through the wood, the wire and tack connection can easily be soldered after all the connections are made.

The upper left-hand switch is for the purpose of cutting in and out the detectors, the connections for which extend up through the lid as shown. (I prefer to use Perikon and Galena detectors with my set.) The short-circuiting switch is shown at the bottom of the diagram while the buzzer push switch is indicated at the lower right side. The double pole switch for changing the condenser from the secondary circuit to the primary circuit is shown at the lower side towards the middle. The switch above this is used for opening the primary circuit for insertion of the condenser by turning it to the right or for cutting in the loading coil by turning it to the left. The loading coil has 150 turns of No. 22 wire wound around a core 4 inches in diameter and ¼ of an inch in thickness.

When this set is employed in connection with an aerial consisting of three wires 130 feet in length by 40 feet in height, without the use of the loading coil will allow adjustments of wave-lengths up to 2,500 meters. With the loading coil 4,000 meters is easily attained. With a good pair of telephones and sensitive detector, using the small aerial as described above, 800 to 1,000 miles is easily attained at night. I discarded a purchased receiving tuner for this of my own construction which gives far better results.

H. A. Latta, *North Carolina.*

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE

A Noiseless Rotary Gap

Amateur wireless experimenters are frequently compelled to say "G. N." to their friends long before the desired time, because certain members of the family object to the noise of the spark gap. The problem is readily solved if the amateur will enclose his spark gap in the following manner:

Figs. 1, 2 and 3 will give a general idea of the construction. No dimen-

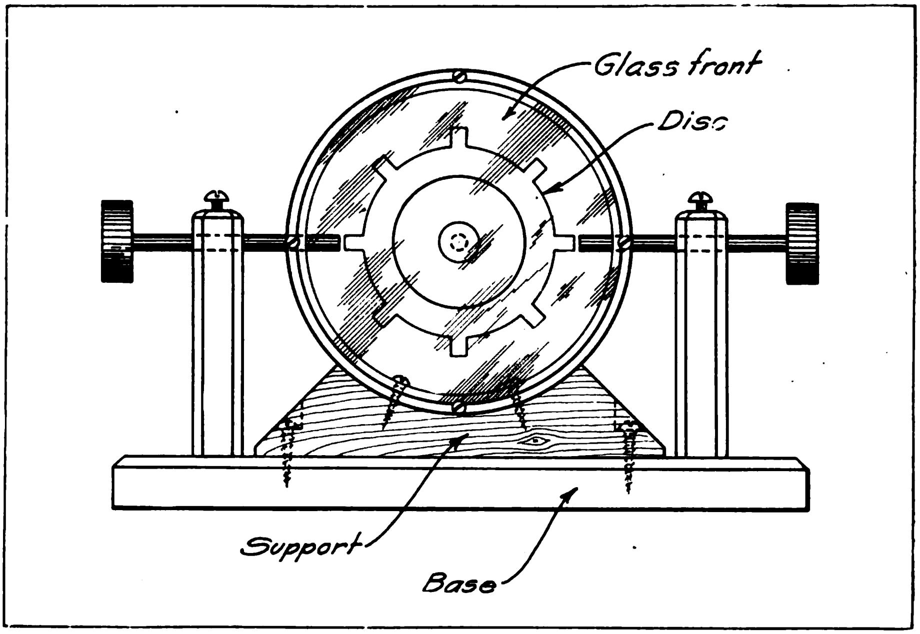


Fig. 1, Fourth Prize Article

sions are given as each amateur has his own ideas and can no doubt make many improvements on my design. The rotary disc is enclosed in a piece of fibre tubing large enough to allow the mounting of a glass case in front so that the working of the disc can be observed.

The piece of fibre tubing should be at least one inch greater in width than the thickness of the rotary disc. A shoulder is cut on the inside of each end of the tube, a piece of sheet fibre is then turned to accurately fit one end of the tube and glued to place. A hole the size of the motor shaft should be bored in the center. The front of the tube is then fitted with a piece of ordinary window glass. The latter should be purchased cut to size. The glass is removable and is fastened in place with four small screws around its edge.

A hole is then bored in each side of

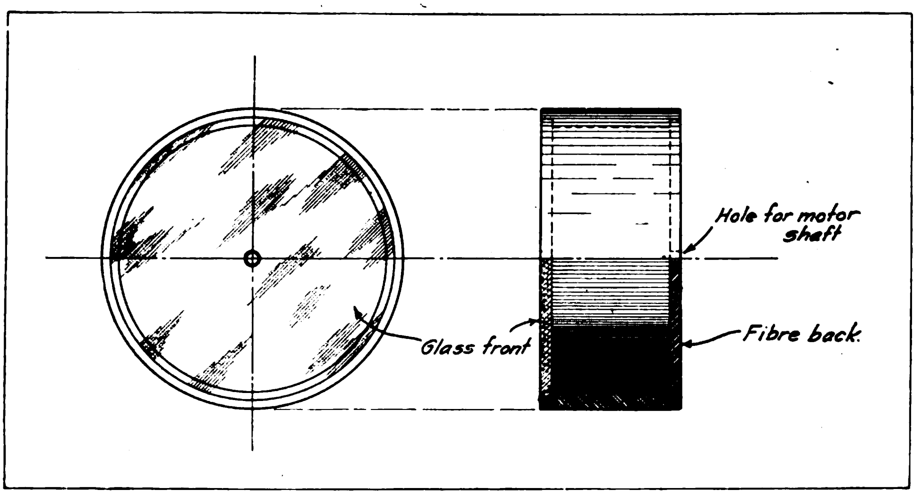


Fig. 2, Fourth Prize Article

the tube to allow the stationary electrodes to pass through the disc. These holes should be a rather tight fit in order to insure silence.

A support for this case is made of wood, fastened by two screws from the inside. The original stationary electrode supports are used as they give strength to the mounting of the drum as a whole. The points not understood will be clear from the drawings.

If the general directions given are followed a very satisfactory piece of apparatus will be produced. It can be constructed at small cost. The experimenter can at all times see his spark and the accompanying crash formerly heard will be done away with.

W. E. WOOD, *Missouri.*

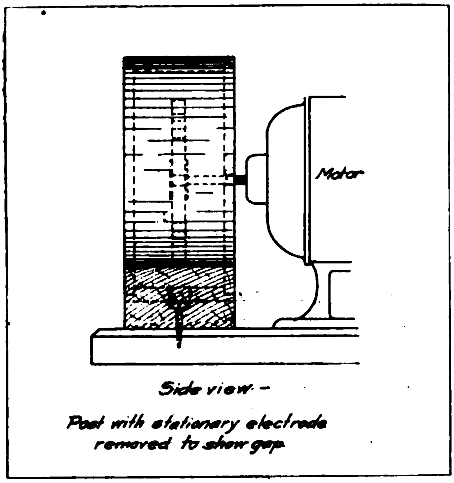


Fig. 3, Fourth Prize Article

HONORARY MENTION
A Handy Fuse and Block

Many amateurs while conducting their first experiments with transmitting apparatus are apt to blow the fuses in the house, putting the place in darkness. In order to prevent this they should construct an inexpensive fuse which will blow at a smaller value of current than that for which the fuses of the house circuit were intended. I devised a scheme whereby tin-foil can be used as the fuse element. I constructed a special block which is preferably of some uninflammable material such as porcelain, slate or fiber, having dimensions of 2 inches by 3 inches by ½ inch. The amateur may construct a similar one by referring to Fig. 1. The holes should be drilled as shown in the sketch, countersinking them if necessary.

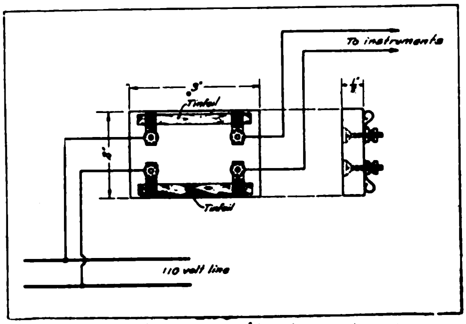


Fig. 1, Honorary Mention Article, Joseph Skliar

Four copper clips should be made out of a piece of thin spring brass as shown in Fig. 2. Two narrow strips of tin-foil are then placed under the clips so as to connect each pair lengthwise. Owing to the fact that tin-foil having different thicknesses is supplied, it will be an easy matter for the experimenter to find a piece that will carry the required current. By placing a few pieces over one another a larger amount of current can be carried than by using a single piece.

The amateur should be sure to start his experiment with a piece of tin-foil

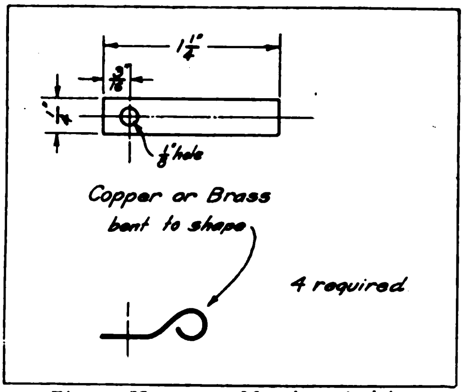


Fig. 2, Honorary Mention Article, Joseph Skliar

that will blow very readily, so as to protect the fuses of the house wiring; after that he can add on foil strip by strip until the desired current capacity is attained. If possible, it would be a good idea to have an ammeter in the circuit to note the current reading at which the tin-foil melts.

JOSEPH SKLIAR, *New York.*

THE AMBITIOUS AMATEUR AND THE TRANSMITTER

THE readers of THE WIRELESS AGE are familiar with the mistakes and discouragements which I met with during my initial steps in the wireless field. They will be interested, therefore, in some later experiences that befell me in the radio world—experiences so exciting that they have impressed themselves only too strongly upon my memory.

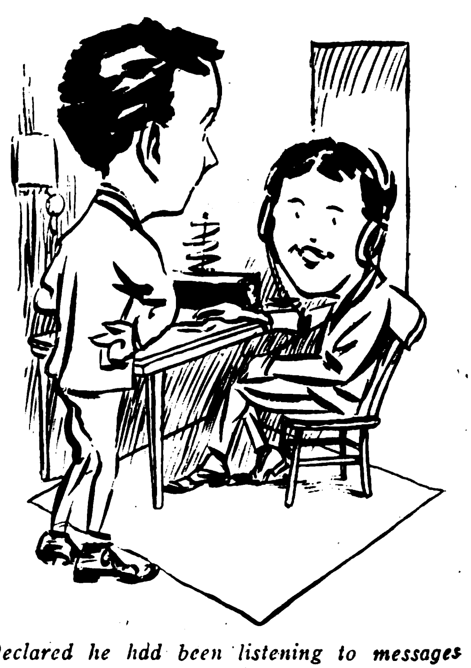
I met with little sympathy from the members of my family after my futile attempts to revolutionize wireless. My father in particular showed little consideration for my feelings.

"You'd better give up chasing a rainbow and stick to your job," was his comment after he had heard of the collapse of my plans. And for a time I had so little spirit that his advice seemed excellent. However, the discipline and drudgery of my modest clerkship in an importing house galled my pride considerably and the ambition to become a person of importance in the wireless field still burned—the flame was dim, it is true, but it was there.

The monotony of my work in the importing house was relieved one day by the discovery that there was a kindred spirit in the office. A chance remark he made revealed that he owned a set and on several occasions we talked about wireless. Finally, I was invited to his home to witness the operation of his apparatus.

Having previously prepared me for the marvelous powers which his wireless apparatus possessed, he piloted me on the evening of my visit to an upper floor of his home where, with the manner of a man exhibiting untold treasures, he pointed out an array of complicated jiggers and parts of wireless equipment that would gladden the heart of any amateur. For one thing there were a number of small boxes with brilliant nickel-plated attachments; mounted on another part of the apparatus were half a dozen odd looking minerals, and here and there in the equipment were arrangements of various designs which slid backwards and forwards. After I had feasted my eyes on the apparatus for several minutes my friend informed me that he would show me how a real wireless telegraph station was operated.

Then I was afforded a glimpse of the supreme faith which my friend had in his own apparatus and his ability to communicate with any part of the world by means of it. For instance, after operating the key for a time, he began to listen in. Suddenly he turned to me with



Declared he hdd been listening to messages from the Eiffel Tower

a look of great importance and declared that he had been listening to messages from the Eiffel Tower in Paris. There was apparently no doubt in his mind as to the veracity of this statement. If it wasn't the Eiffel Tower he was listening to, it ought to be at least. Didn't it sound exactly like the Eiffel Tower? To be sure there was another amateur in the same block who had a three-inch coil with a characteristic similar to the Eiffel Tower. However, I have found that there are some amateurs who rely on their imaginations to bolster up their confidence in their apparatus. My friend, I concluded, belonged in this category.

During the evening the germ of wireless ambition which had been dormant in me since the ending of my earlier experiences began to work vigorously. It was still in action when I awakened the next morning and as soon as the opportunity presented itself I resolved to begin anew my excursions into the realm of wireless. The receiving apparatus which I had employed in my previous experiments did not compare favorably with that of my friend—it made my equipment appear quite inadequate in fact. I decided, therefore, to take steps to bring it up-to-date. With this idea in mind I made my way to the store of the Dielectric Exporting Company where I purchased a "loose-coupler."

That night I made a perfunctory examination of my newly-acquired piece of apparatus. I was not quite sure just how it performed its functions, being positive only that it was intended for the purpose of receiving. But after I had glanced at it a couple of times I found out something else—that it was loose, indeed, from the aerial binding post to the base itself. In fact, about the only part of the apparatus that was properly coupled was the name plate. The base was warped to such an extent that it resembled a convex parabola and the windings looked like an uncoiled spring. As for the sliding contacts they were lacking in activity so much that it required several blows from a hammer to free them. I was somewhat disheartened by the discovery of these defects in the apparatus, but viewing oil as a sovereign remedy for all things amiss

Several cigars brought about a change of view

with a wireless set I applied liberal quantities of it to the "loose-coupler."

It was about this time that we moved into another apartment house. Ordinarily this fact would not be worthy of mention, but when one is an amateur wireless enthusiast it carries great portent; for it is not every janitor who is in sympathy with the struggling young wireless man to the extent of permitting him to carry on experiments which sometimes disturb the serenity of the other tenants. The janitor of the house which we left was a stolid German, who was not disposed to interfere with what I did in radio work. I found, however, that the person who looked after the well-being of the building in which we made our new home of a different caliber. At first he was even opposed to having the wireless set in the house. But the process of transferring several cigars from my father's stock to the pockets of the janitor soon brought about a change of view in the latter. He was still obdurate to a certain degree, though. The clothes line to him had little of harm in it, but anything connected with the "dangerous electric current" was placed under the ban. I used my best powers of persuasion and more of my father's cigars to good effect, however, and at length I was permitted to stretch a sin-

gle wire aerial from corner to corner of the house and then to a set of clothes line poles.

As I prepared the construction and began the final erection of my aerial I glimpsed a wire extending from a distant corner of the structure to a second set of clothes line poles, finally disappearing in a window nearby. I experienced a feeling of relief. In union there is strength, I had been told, and I reflected that if there was a general uprising against amateurs I would have one supporter at least. This thought was followed by one not so pleasing. I had been compelled to place my aerial dangerously close to that of my neighbor and previous experience had shown me that electrical current could not be induced to behave under certain conditions. It had a way of jumping several inches to the nearest metallic object in a most disconcerting manner.

While these impressions were buzzing in my mind I kept steadily at work and at length the task was completed, the aerial being connected to the proper posts on the "loose-coupler," according to instructions. Then I moved several little duflickers up and down the scale. I waited expectantly for something to happen, but there was no result except a humming noise. Something must be wrong with the apparatus. I examined it carefully. Eureka! I had neglected to insert the crystal—a small chunk of coal-like substance—as the instructions directed. It would make the signals readable, they said.

Having properly placed the crystal, a number of small sparks began to jump about the latter. This aroused my investigative spirit to a high degree and I employed my fingers to obtain results. The latter were far from what I expected. I received a shock which was the equal in severity of anything I had ever experienced previously in my most trying experiments.

For a time I was puzzled as to what steps to take next. I was also cautious, the recollection of the shock I had received having been strongly impressed upon my memory. After due reflection, however, I came to the conclusion that my error lay in the fact that I had not inserted a fuse. I reasoned that as it had been found useful in the transmitting apparatus it should be of equal value in the receiver. There was a question in my mind, however, as to whether the fuse should be placed in the head telephone circuit or in the antenna itself, but I finally decided on the latter.

Sure of receiving protection from shock, I wore the head phones and again attempted to make the crystal responsive. As I did so—biff! bang! Once more the results had proven disastrous and I found myself felled to the floor by a jolt that was as effective as the kick of a mule. There followed a period of a minute or two when my restless ambitions to excel in the wireless field became vague and dim. I saw only a blank space. Then a bucketful of water thrown into my face by a member of my family aroused me and I became conscious of a row of grinning faces and heard various remarks about fools rushing in where angels did not even dare to take a peep.

When I went to bed that evening I was somewhat sore both in body and spirit. But the latter part of the next day found me again busy with my set. Then I observed that the aerial of my neighbor had become crossed with mine. An inquiry showed that he had extended an invitation by wireless on the previous evening to a friend to visit him at his home. As this was about the time I was experimenting with the crystal I received the invitation intended for his friend—also a shock.

The crossed wires were cleared the following evening and for the first time I heard wireless telegraph signals at my own station. This was my hour of triumph and I hurriedly summoned the members of my family to witness it. Every one except father extended congratulations. He, however, demanded to know what the distant station was communicating. My spirits suddenly sank. This was something that had not occurred to me and suddenly it dawned upon me that I was lacking in something quite vital to a wireless man—I had not learned the telegraph codes. Between the signals I heard rasping, scratchy, wheezy noises, some of which my friends

who professed to have considerable knowledge of wireless told me originated at wireless stations in China. I gathered consolation from their statement that these signals were sent in Chinese and I could not be expected to read them.

It was some time afterward that I learned that practical wireless men called these sounds static. The name itself, it seemed to me, was one to conjure with. Static, according to the information I obtained, was a contrary phenomenon, an ethereal vagabond, which always appeared when it was not wanted, no one knowing whence it came or where it went. When the full significance of this information broke upon me, I evolved a brilliant idea—I would divert the static from its normal path to earth by means of a bottle of water. The wireless signals would not necessarily follow because they were intended for the apparatus. It was a big idea and one that was worthy of me. Fame was so near that I could almost reach out and clutch it. I felt sorry for some of my friends who were interested in wireless only to the extent of sending and receiving. Perhaps it was my duty to let them share in the glory and the wealth that would come from my inspiration. But no. I couldn't afford to take anyone into my confidence. I must work alone.

And it is my one consolation that I did not share my secret with anyone. For my scheme to divert the elusive phenomenon was, I am ashamed to relate, a sad failure. Something was lacking—perhaps a sign post to direct the energy or a little coaxing from some source as yet undiscovered. Not that the static did not disappear. It vanished completely. The signals, however, also followed the static and I soon became aware that there was only one effective method to overcome the difficulty—that was to completely dismantle the wireless station. Therefore I abandoned my scheme to defeat static.

My restless ambitions to excel in the wireless field became vague and dim

I was still unable to read the signals which came into my station and while I was engaged in the telegraph codes I asked one of my friends who had acquired some little skill in the art to translate them. The ease with which he talked of the apparatus excited my envy, for he referred incessantly to the lack of resonance, dirty contacts on the apparatus, and other matters completely beyond my powers of understanding. I was much interested in the messages which he copied as they came into the station. I learned of business transactions between merchants and their employees, of messages between sweethearts and of confidential communications between a theatrical manager and a star. These messages I took delight in telling others about.

By this time I was thoroughly absorbed in wireless. The majority of my friends read The Wireless Age and finally I subscribed to the magazine. In it I learned of the results obtained by amateurs who had employed bedsteads as aerials. This method appealed to me strongly. It would, I reflected, do away with the possibility of another short circuit between my aerial and that of my neighbor.

To resurrect my old transmitting

equipment and connect it together piece by piece was not a difficult task and one evening I found myself ready for the experiment. I first connected a wire to my own bedstead and made preliminary experiments. The signals were not heard, however, and after giving the matter some thought I decided that I had not used enough capacity. Two beds would increase the range, I reasoned, and I thought of the one in my parents' room. I did not relish the idea of bringing my father into the experiment, no matter how indirectly, but as the night was fairly well advanced and everyone in the household except myself had retired there seemed little likelihood that he would become aware of what was taking place. So, as quietly as possible, I entered my parents' apartment and made the connection. As I crept out of the room I congratulated myself on my luck—they had not even stirred in their slumber. Somewhat exhilarated by my success, I was moved to extend the connection to the bed occupied by my aunt in an adjoining room. It would increase the range of my transmitting apparatus still more, I told myself.

It was about midnight when I screwed a plug in the lamp socket and examined all the connections. I recall that there was absolute stillness just before I reached out to touch the key of my set. Then I pressed it and the next instant there was a clamor which can only be likened to bedlam. In the confusion I heard expressions couched in no gentle language from my father and screams from my aunt. I did not need to be told that it would be well for me to make myself as inconspicuous as possible, and when the door of my room opened I had the bedclothes tucked up to my chin and was snoring loudly.

There is no need to dwell on the painful scenes which took place between me and my father when the details of my prospective experiment were revealed. I tried to make it plain to him that I had not the slightest idea that the persons in the beds would be shocked when I pressed the key. And he might have condoned this incident but for something unforeseen which occurred.

The Department of Commerce, it seems, learned that I had spread broadcast the messages which came into my station. This, I was informed in an official communication, was a violation of the rules of the International Radio Telegraphic Convention. When my case came up for trial I pleaded ignorance of the law, but notwithstanding I was fined $25.

I had the bedclothes tucked up to my chin and was snoring loudly

I did not know where to turn to place my hands on the amount of cash necessary to meet the penalty for my failure to observe the law. And so I worried and worried until father noticed by perturbation.

After some grumbling he paid the fine. He did not do so with very good grace, however. Sometimes he refers in a sarcastic vein to my wireless adventures and I ask him point blank: "Didn't you take part in one of my experiments?" Then his mind harks back to the night of the bedstead experiment and he voices an emphatic "Yes!"

IN THE SERVICE

SHORE-TO-SHIP DIVISION

In the earlier days of his life, Thomas M. Stevens, superintendent of the Southern Division of the Marconi Company, spent several years in the United States navy. The first year of his enlistment found him serving on several battleships, among them being the Iowa. It was about this time that the Iowa was first equipped with wireless. There was only one man in charge of the equipment and Stevens learned from him all that he could about the art, becoming so proficient that he was able to relieve the regular operator. This gave Stevens an opportunity to gain practical experience, and he made the most of it.

Orders came to the Iowa in 1904 to transfer the regular wireless operator to a naval coast station, Stevens being summoned aft to the captain soon afterward. The latter wanted to know if he could take charge of the wireless. Stevens knew that he could and he said so. Since that time he has been a wireless man.

Stevens was born in Sealy, Tex., October 13, 1885, but soon afterward his parents removed their home to a farm. Rural life did not hold great attractions for him apparently, for at the age of fourteen he changed his residence to Austin. Employment in a carpenter shop and a detail as a messenger in a telegraph office occupied his working hours until he joined the Navy, from which he was honorably discharged. Then he returned to Austin, where he obtained employment with a wireless telegraph company. He exhibited a station at the International Fair held in San Antonio in 1906 and was afterward placed in charge of stations at Houston and Port Arthur, Tex. He relates that when he was attached to the Houston station consisting of three rooms, one of which he used for sleeping quarters, he was awakened on one occasion at three o'clock in the morning by a loud crash. Investigation showed that lightning had struck the aerial, made its way into the station and jumped to the wires on which several pictures were suspended, causing them to fall to the floor. This incident occurred in the days before the ground switch had come into use.

Transferring the scene of his activities not long afterward to New York and Boston, he served as operator on various steamships, among which were the City of Atlanta, the C. W. Morse, the Merida and the Harvard. He was transferred from the latter to a station which had just been built on the Boston Herald building. He remained on this detail until it was dismantled and replaced by a station at Quincy, Mass.

The Marconi Company expanded its field of operations a short time afterward and Stevens entered its service, being placed in charge of the construction of the Boston station, which is today looked upon as one of the important commercial stations on the Atlantic coast. In November, 1914, he was transferred from Boston to Baltimore, where he relieved C. J. Pannill as superintendent of the Southern Division.

"WHA"—

Cape Hatteras

As Seen by
N. E. Albee, *Manager*
Marconi Wireless Station

NO name on the Atlantic Coast is more widely known than Cape Hatteras, dreaded by sailors and feared by travelers. But aside from newspaper reports of disasters at this point from time to time, very little is generally known of the place. Up to the time of writing the most ambitious attempt made to enlighten the public on the doings in this little world of ours is credited to a lady writer, who is said to have published a small book many years ago graphically describing the wild beasts in the swamps, relating harrowing stories of pirates and shipwrecks, and weirdly depicting the sight of bleaching skeletons on the hot sands. It must be admitted this author had imagination, but as a narrator of facts she displayed no particular talent. There are neither wild beasts, pirates nor grinning skeletons.

We do have shipwrecks, many of them, but bodies seldom come ashore owing to the swiftness of the Gulf Stream, and even should an accident occur near the shore with a ship driven over the breakers and lives lost, then any bodies washed up on the beach would soon be discovered by the patrol and given decent burial. The last case of this kind occurred about four years ago when several bodies drifted in after a schooner was wrecked on the beach.

Cape Hatteras is an island, having a length of fifty miles on the coast line and forty as the crow flies. Its greatest width is four miles from the extremity of the Cape to Piney Point. It has an average width of less than two miles. The formation is composed entirely of sand and trees interspersed with low, swampy and marshy sections. Most of the wooded section lies between and including the two villages of Buxton and Frisco, a distance of eight miles. Roughly estimating, the whole population of the island is about eighteen hundred or two thousand inhabitants, and the nearest point to mainland is thirty-five miles across Pamlico Sound to Middletown, in North Carolina. The distance to Elizabeth City, N. C., is one hundred miles. From the latter place all mail, merchandise and travelers are carried in small gasoline launches or light draught sailboats. One or two days are required to make the trip in either direction and when the weather is stormy traffic is held up for several days at a time. During the winter of 1911-12, ice delayed the mail and supply boats for five weeks. The stock of provisions in the stores became exhausted and with the increasing anxiety of the people it was feared we would be compelled to appeal to the Civil authorities for aid, landing provisions by one of the government boats from the outside.

Pamlico Sound covers a vast area but its waters are shallow, and navigable

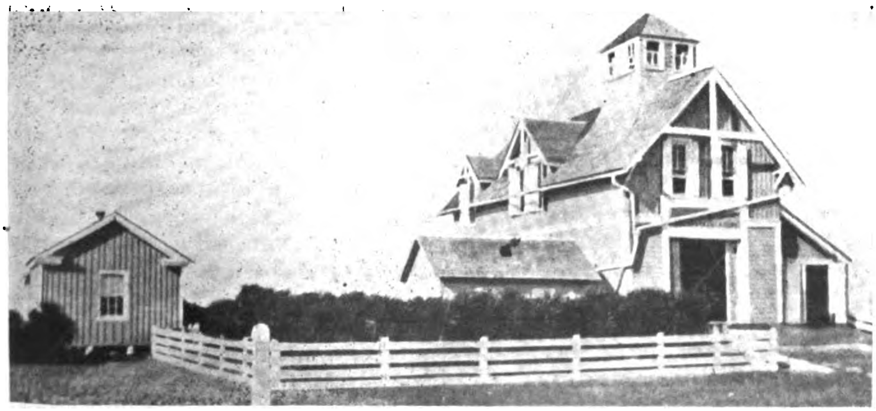
only to sloops, schooners and launches. The channel, which is often difficult, owing to the numerous shoals, is the only safe place for these boats to gain passage. Passengers traveling from the North are subjected to many discomforts.

Leaving Elizabeth City at noon the boat stops over night at Roanoke Island where may be obtained meals and lodging, of a kind. The next morning at five o'clock they enter the open Sound, often encountering rough weather, shipping water over the side, rolling and pitching heavily, harassed by the motion and almost overwhelmed by gaseous fumes of the engine and the striking of the flat bottom boat upon the shoals with force enough to jar teeth loose. For nine hours this journey is continued, seldom within sight of land, the arrival at the boat landing being made at three o"clock in the afternoon. They must now embark in a small flat bottom skiff to be poled ashore through the shallow water which prevents nearer approach of the launch, fortunate to escape a wetting if it happens to be rough.

Cape Hatteras lighthouse is the first interesting object to be met with. The light formerly flashed yellow every ten seconds, but has recently been changed to six seconds' flash and, equipped with a vaporizer or mantle which makes a white light, renders unnecessary the changing of lamps at midnight and decreases the oil consumption to one-half. Towering 196 feet above the mean high water, it can be easily visible at a distance of twenty nautical miles and has been seen forty miles away. The tower is black and white, spirally banded; red brick base with granite corners; walls are thirteen feet thick at bottom and four feet thick at top.

On the mound where the old lighthouse, built in 1798, stood may be seen what is known as the "weeping rock," an odd freak of nature. Rain or shine, day or night, this rock weeps copiously and continuously as though grieving over the death of the old tower. Even during the hot summer months when the earth is parched and cattle go to the swamps for water the rock never ceases dripping.

Keeper F. E. Simpson is a veteran of thirty years' service. He occupies a two-story brick building furnished by the government, his two assistants being each provided with a two-story frame house. Each man stands a twenty-four hour watch, going on and off duty at midnight. They are not required to be in the tower from sunrise to sunset, but they must keep a careful watch on the outside during that time, prepared to meet any emergency that may arise. Recent orders from the inspector at Baltimore prohibit the men from being absent more than six hours without first obtaining permission, all of which time is counted in the thirty days' yearly leave of absence. The keeper has authority to grant leave for two days only. If time absent should amount to more than



The famous life-saving station, known far and wide for the heroism of its fearless crew

the allotted thirty days the difference is deducted from that of the following year.

In 1879 the keeper received a salary of four hundred dollars a year and surfmen thirty dollars per month. In 1883 it was increased to seven hundred dollars a year for keeper and fifty dollars per month to surfmen. The present salary is one thousand dollars a year to keeper and sixty-five dollars per month to surfmen, with an allowance of nine dollars per month for food. The keeper is on duty during the whole year, but surfmen, the first man of which receives five dollars a month more than the others, are off duty and payroll during June and July of every year.

Representative Townsend, of Michigan, introduced a bill in the House last spring to change the entire system, placing the life saving department under the jurisdiction of the Revenue Cutter Service and classing the keepers as warrant officers, first man as chief petty officer and the surfmen as enlisted men. The bill was tabled because of the Panama Bill and other vital issues then before Congress, and since the salaries in the Revenue Cutter Service are much less than those received at the present time, the Hatteras men hope the bill will receive its death warrant before the opening of the next session.

When the service was first inaugurated open surf boats manned by oars were in use; now they are either equipped with gasoline engines or sails, and the number of men has been increased from keeper and six surfmen to keeper and eight surfmen.

It used to be that if one of the men was taken sick he was obliged to furnish his own substitute at his expense; now both he and the substitute receive the regular salary, and should the sufferer become incapacitated from further duty, he is given an honorable discharge with two years' pay.

During the early days when ships went ashore the cargo was invariably a total loss because of the lack of facilities to dispose of it. The nearest line of communication was by telegraph from Norfolk: to reach there it was necessary to go by sail to Elizabeth City and thence to Norfolk by hack, three weeks' time being consumed in making the trip. Consequently cargoes were sold at any price, as, for instance, Captain Dailey's purchase of 5,000 pounds of tobacco for five dollars while he was keeper of Hatteras station.

Fourteen and a quarter miles to the southeast is moored Diamond Shoals lightship, established in 1897 and equipped with wireless which at times has rendered valuable service when the vessel was blown away from its station, and once when it was in collision with a schooner. It is frequently used to report vessels not equipped with wireless and receives local recognition as the place where naval operators grow whiskers and discontent.

During a period of four weeks, when the writer first came to Hatteras, eleven wrecks occurred, yet not a single loss of life was reported. The record of efficient service rendered by the revenue cutters and life savers is one of fearless courage and many daring rescues have added glorious chapters to the history of their department.

To illustrate the work confronting them, the following narrative of one of the eleven disasters is given:

The three masted schooner Harry Prescott, of New Haven, Connecticut, loaded with salt, bound from New York to Wilmington, North Carolina, with a crew of seven men, lost both anchors in a big ice jam inside the Delaware Breakwater, where they had taken refuge from the rough weather outside. Passing Hatteras on a Monday they ran into strong south winds a few days later and were forced to turn back. While making for a point of safety north of the shoals until the weather moderated they mistook the Hatteras light for Diamond Shoals lightship. As both the lights at the lighthouse and light vessel appear to diminish in brightness similarly to a far observer, the captain believed himself to be in a direct line, with both lights on the light vessel appearing as one. Running ahead of a thirty-five mile wind at 9:30 P. M. the schooner struck with terrific force on the southwest point of the inner slew. Signals of distress were

seen by the lookout at the station and shore fires burned all night. From daylight until afternoon crews from the Cape Hatteras and Creeds Hill stations made desperate attempts to reach the men who were seen clinging to the rigging. At eleven o'clock they succeeded in throwing lines to the aft of the vessel and saved the skipper, mate and cook, who tied themselves to the lines, jumped overboard and were hauled aboard the lifeboat. All efforts to reach the four men on the jibboom were unavailing against the five mile tide and heavy seas. The deck and houses had washed away and the men were unable to make their way aft, the only place that could be reached by lines from the lifeboats. A large hole was rammed in one lifeboat by floating wreckage. In spite of the united efforts of the crew to keep the boat's head to the sea water was shipped over the sides, completely drenching the men and putting the engine out of commission. The men returned in an exhausted condition and with aching hearts at the appeals of the four men whom they were forced to abandon temporarily. Slight hope was held out for their recovery, but as a last resort calls were sent out from the wireless station to the revenue cutter Itasca, which put on full speed and arrived on the scene at nine o'clock that night. Creeds Hill station crew immediately braved the high seas to reach the revenue cutter, where they remained over night to prepare for an early rescue at daybreak. They were outdone, however, for early the next morning the Cape Hatteras crew distinguished themselves by completing the work of rescue in the face of the still raging storm and mountainous seas; thus retaining the well earned honor, long theirs, of rendering such meritorious service as none other has achieved.

It is interesting to note that seas may be rolling high on one side of the Cape and moderate on the other side. When the sea is unusually rough boats are put out on the lee side, but during low water are often unable to get over Bird Shoals.

This promontory lives up to its reputation for storms and winds which often reach hurricane force, lashing the waters of the ocean into a wild fury. With a rumbling sound that can be heard for miles the high rolling seas dash over nature's seawall and across the open beach with a rush and roar, sweeping everything before. White-crested and with flying spray glittering in the sunlight, the waves present a noble sight after the storm has subsided.

The operators live principally in the open air, and a few months creates vast improvements in those used to the narrow confines of the city

After several days of strong northwest winds the tide rose at midnight of January 5, 1914, with amazing rapidity, completely submerging all the lower levels of the island with in a few hours' time. Rising at the rate of about one foot an hour before dawn, it had overflowed the banks and covered the site occupied by the wireless station and surrounding buildings to such a depth that the operators were unable to pass from the office to the dwelling house without wading over the tops of their hip-boots. A swift current, almost reaching floor level, surged around the living quarters and dashed large floating logs against the house.

On the night of September 2, 1913, a hurricane swept over the Banks, razing the wireless masts and several houses in nearby villages. Reaching a maximum velocity of 102 miles an hour its effect was terrific. At Avon one house was carried several hundred feet and landed in an upright position minus the front porch. Another house was completely demolished, but without injuring its four occupants. The bed upon which the father and mother were sleeping in a room upstairs dropped to earth beside the bed upon

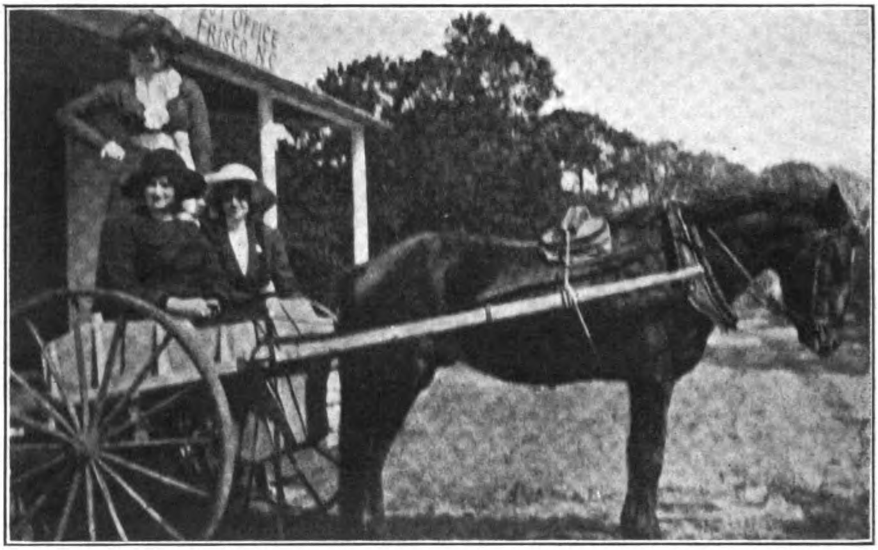
which lay the two children who had been sleeping in a room beneath them. This is a freak of wind almost beyond credibility, yet scores are willing to testify to the truth of the incident just as I have related it.

The government's Weather Bureau office at Hatteras is looked upon by the department as one of the most important on the eastern coast. The chief was once heard to remark that he had rather lose observations from any two stations rather than Hatteras. The building, which is a combination office and dwelling and one of the finest in the county, is equipped with all modern conveniences such as water works, gas lights, a steam heating plant, filtered drinking water and a large well-equipped office.

A government telegraph line extends from this observatory through the office at the wireless station, the Weather Bureau observatories at Manteo, N. C., Cape Henry and Norfolk, Va., to the Postal and Western Union offices at Norfolk. Because of the distance and having to run by cable for several miles under the Ocacoke and New inlets, it often gets weak and heavy during damp weather, or is parted by gales of wind sweeping the coast. In spite of these adversities, however, the line is kept in remarkably fine working order through the careful and watchful guidance of Chief Operator Newsom, forecaster and officer-in-charge at Cape Henry.

On Hatteras there is an abundance of grass in the spring and summer and cattle are allowed to roam at will over the island, subsisting as best they can upon grass, leaves and berries; in winter when the beach front and marshes become barren, the cattle stay in the woods eating bushes and berries, but that these prove inadequate for their needs is evidenced by their condition and the large number of deaths. Although there are hundreds of cows, very few milch cows are to be seen, the people depending entirely upon condensed milk. Occasionally during the winter some of the cattle are killed and marketed from house to house, and it is then, and only then, that we get a taste of real beef.

Pigs are numerous and may be purchased very cheaply, though the so-called "razor backs" are worn thin in a vain endeavor to find a fat living. Gifted with an extremely long nose,



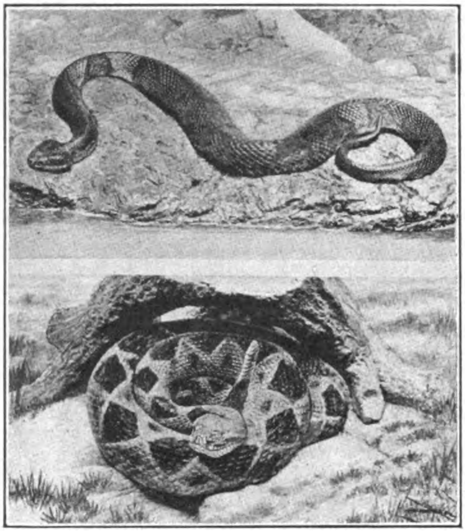
This type of cart is used for driving through the heavy sand and was the universal means of land transportation up to a short time ago when a lone automobile made its appearance to remain a source of increasing wonder

they would prove a valuable asset to some road gang if they could be prevented from plying their nefarious occupation—with all the vigor of starving hyenas rooting up lawns and gardens until they resemble in appearance a newly ploughed field. A couple of these creatures could turn over more sod in one day than a large plough towed by a pair of Missouri mules, especially if they were hungry and there happened to be some sweet juicy roots to tempt them. The lure of the kitchen, however, is strongest, for when smoke begins to roll out of the chimney top they gather around and calmly wait for bounty to issue forth. On one occasion—so the story goes—a "razor back" discovered a bountiful supply of foodstuff in a dog kennel. Believing it to be a Thanksgiving feast, he spent a blissful holiday there, doing full justice to the fare. After he had partaken of the good things, however, he learned to his sorrow that he had outgrown himself and his portly sides were tightly wedged in the doorway. There he expired.

Undoubtedly Hatteras is the worst place in the universe for snakes and insects. We have snakes of many varieties, the most common being the black snake, corn snake, green snake, water moccasin, garter snake, chicken snake, cotton mouth moccasin, spreading viper and rattlesnake. Black and corn snakes are often six and seven feet in length and considered harmless. Green snakes are the color of green leaves and may be seen running up vines or overhead on the limbs of trees while passing through the woods. The lightning rapidity with which this reptile travels around and over the surrounding trees and bushes is amazing. Water moccasins are found in large numbers, but there is a divided opinion as to whether or not this particular type of snake is poisonous. It habitates the marshes principally, seeming to delight in swimming the creeks, although it may be seen aywhere. The chicken snake is so-called because it is a constant menace to chickens. Crawling unobserved into chicken houses it soon destroys the small ones. Not in the least frightened by the approach of a person it remains partly concealed and fights if any attempt is made to rout it. A young lady was bitten severely by one several weeks ago and it held on to her hand with all the tenacity of a bulldog while she ran screaming to the house. Cotton mouth moccasin is another type of water moccasin of a very poisonous nature. It frequents the lowlands and, being nearly the color of the grass and sage, remains hidden until its victim approaches within striking distance. Its size is about that of a man's forearm and three feet in length. Possessed of a large mouth and wicked fangs its bite means almost instant death to man or beast. The spreading viper is distinguishable by the peculiar manner in which it spreads or flattens itself out. It also is very poisonous and may be seen almost anywhere. The rattlesnake seldom leaves the swamps, and we are spared the horror of feeling its nearness. As every one knows it coils, rises on end, jumps as much as five or six feet and strikes with unerring aim. On several occasions horses and cattle have been bitten by rattlesnakes, but human beings have thus far escaped, so far as I know.

The unexpected appearance of snakes causes a mixture of sensations, the paramount desire of man being to kill, and of woman to flee. One wireless operator had the courage to catch a snake alive, using a forked stick to hold it until he could get it tightly gripped by the back of the neck. Then the reptile could squirm and entwine itself around his arm all it liked; but only around *his* arm. We all stayed our distance. After many years on Hatteras my advice is, beware of the so-called "harmless" snakes. Nothing is commoner than misrepresentation and misidentification of snakes; consequently many deaths result. An expert from the Smithsonian Institution came here several years ago in search of snake species, and while demonstrating the fact that water moccasins were not poisonous was badly bitten by one, the injury developing into such a serious case of blood poisoning that he was removed to a hospital.

It would be surprising to many read-



According to the author, Hatteras is the worst place in the universe for snakes. A cotton mouth moccasin is shown in the upper picture and a deadly diamond rattler in the lower

ers, and a delight to the entomologist, to see the many kinds of insects hovering on the outside of window screens on a calm night, varying in all sizes and colors from the gnat to the aeroplane and hobbyhorse bugs. Entering through unseen places and resisting all efforts to drive them out, our life on such nights is not an enviable one, for they are constantly flying in our faces and lodging in hair and underclothes. There are three kinds of ticks: the small seed tick, difficult to locate; the medium size tick, numerous on bushes, and the large ones seen on cattle. Tick bites leave aggravating sores that itch for five or sick weeks afterward. Fleas are the most hateful and elusive of all the insects; biting sharply, they hop about until your nerves are on the jump. The bites often form into small sores, which come to a white head and pass away in two or three days time. The writer has picked as many as fifty-one fleas from his body and clothes during three hours on duty. Both the plain and the spotted legged mosquitoes infest this whole region, being about as numerous as grains of sand on the seashore. The spotted-leg mosquito, said to be the origin of malaria and yellow fever, produces with its bite a white swelling of surprisingly large dimensions. Wasps are plentiful, but fortunately we have thus far escaped their sting; nevertheless, a dozen or more made it extremely uncomfortable for yours truly several weeks ago while busily engaged at the top of one of the masts.

Viewing the more human aspects of nature and natives, fishing is the principal ocupation of the men not in the government employ at the lighthouses, life saving stations and on the lightships. Fishing is carried on very extensively and enormous amounts are shipped daily to the city markets. Some of the finest roe shad in the country are caught in this vicinity. Prices vary from two dollars apiece at the opening of the season, to thirty-five cents at the close. Some days large catches are made, then again weeks pass without more than enough to feed the men in camp. One man, it is reported, made an eight hundred dollar catch in one day of last spring. If the season is a bountiful one prosperity reigns everywhere throughout the Island.

Another occupation, though somewhat out of date, is that of making yeopon tea. For reasons unknown, this class of work is considered more or less degrading, and to some of the people the very name means fight. The tea has a very bitter taste, and is not only in local use, but marketed to the cities. The leaves and small twigs of yeopon bushes, five to fifteen feet in height, are chopped fine in a large trough, packed with hot stones into boxes or bins, containing about thirty bushels, then buried underground and left to steam for two days until cured. Although this tea is almost as bitter as green persimmons, not a grain of sugar is used in it. Why this work is inferior to fishing and other occupations is a mystery.

Tramps and beggars are never seen and the only strangers that make their appearance are traveling salesmen, government inspectors and sportsmen. The Norwegian cook of whom so much has been said and written when formerly attached to the wireless station

for six or seven years, made his exit when the first operators married; he disappeared as mysteriously as he came. There is one negro, reared by a private family, and who claims some distinction as a baker.

An automobile was recently purchased by one of the more prosperous residents. Its appearance caused a big flurry all over the Banks. Whenever the whirring sound is heard coming down the road nearly every one rushes for a sight of it. In fact, it is becoming so that many of us who have seen enough autos to carry the entire German army into Paris at one trip, invariably rush to the door when it passes. The noise and sight of this machine always cause horses and cattle to flee helter-skelter. Some of the more venturesome stop at a safe distance, elevate their heads about ninety degrees, and gaze in wonderment at the strange sight.

Superstition among the natives is prevalent in all classes to a remarkable extent. For instance: one man will tell you that a cat is possessed of the devil and to shoot one will render the gun unfit for use forever afterwards, unless by some chance its witchery can be destroyed. If the gun is laid on the ground and the chickens fed over it, then there is a possibility of it regaining, in part, its former usefulness. Funny, isn't it? But if you could hear the man tell how his fine gun was ruined by killing a cat; how he, a crack shot, could not hit a large shingle thirty or forty feet away—then you might feel inclined to place some credence in the story. Perhaps it should not be told, but this man actually had the audacity to sell that gun, at a great sacrifice, of course, without even telling the purchaser that a cat had been shot with it.

The Gulf Stream, flowing within a few miles of shore, makes the climate mild and pleasant during the Winter months. Only one snowstorm of consequence has fallen in several years. Efforts have been made in the past to interest financial and influential men into forming a winter resort here. Were it not for the delay and inconvenience in reaching this place, the plan would prove both practicable and profitable.

Something may now be said of the wireless station, which has been instrumental in saving lives and property from the ravages of the sea. As the ships plough their way through the waters around the dangerous shoals, weather beaten and storm tossed by nature's elements, an operator is constantly on duty at the instruments, listening with trained ears for the dreaded signals of ships in distress or the ordinary traffic which marks the daily routine of station work.

A few years ago when wireless was making its bow to the public in recognition of the place early set aside for it in the world of fame, when but one operator sailed on each ship, the traffic was light; it was absolutely quiet during many hours of darkness. As the ships slipped silently by in the night there was scarcely a sound to break the oppressive stillness. Things have changed in the few years since and the wireless now gives forth a constant hum of activity and usefulness to commerce and industry.

Strange things often occur which the public never knows. On a disastrous night three years ago, at two o'clock in the morning, the torpedo boat Warrington sent out cries for help. The operator had just taken off his receivers and was fixing the fire preparatory to closing the office and retiring for the night. Prompted by some mysterious force, he was irresistibly drawn toward the telephone receivers which lay on the operating table. Placing these over his ears, he was rewarded by hearing the S. O. S. signal. Unable to learn its origin, for the signals soon faded away, he called frantically for further particulars. In a few minutes the answer came weakly back that the Warrington was badly damaged in a collision and believed to be sinking. In a short time after the location was given, boats were dispatched to her assistance.

The Hatteras operator was the only one known to have heard the distress call and great importance is attached to the event.

Living chiefly in the open air; sail-

The life of the operators bears some relation to the primitive days when every man was of necessity a Jack-at-all-trades. Aspirants for assignments will do well to prepare themselves in accord with this illustration

ing over the waters of the Sound in the cool twilight; plunging through the high rolling seas on hot summer days; tramping mile upon mile over the marshes and through the woods in quest of game in winter; with just enough hard work about the engines and around the station to keep the muscles well developed, the operators are strong and healthy. Several months of this out-of-door life creates vast changes and improvements in those who have come from the narrow confines of the city.

Life here bears some likeness to the primitive days when every man was a Jack-at-all-trades. The operator must necessarily be a commercial and radio telegrapher, electrician, engineer, machinist, plumber, carpenter, blacksmith, tinsmith, barber, butcher, cobbler, tailor, bootblack and cook. At various times he is called upon to do things that require some knowledge of all these trades. Therefore, it behooves any one anticipating an assignment to Hatteras to qualify himself accordingly. If he knows nothing of these things when he arrives, he will surely know something when he departs, provided, of course, he doesn't leave the next day, as did one young hopeful.

Nestling among the hills where the beach and pines meet, sheltered from the cool western winds and open to the cool southern and eastern breezes of the summer, the station has an ideal location. It is situated a quarter of a mile back from the surf, three-quarters of a mile from the lighthouse, one mile from the post office, one and one-half miles from the stores and center of village, two miles from the life saving station and churches, and two and one-half miles from the boat landings. This distance is usually covered by foot through heavy sand over which a mile is equivalent to two.

The first wireless station was erected at Piney Hills, facing Pamlico Sound, and used by its builder for experimental purposes. A similar station was placed on Roanoke Island, fifty miles distant. The first station ever used for commercial purposes was built about twelve years ago. Several years later the tower was blown down by a hurricane. Two masts were then erected, only to meet the same fate two years ago. Special care was given in selecting and erecting the present masts, which are of Norway pine, five hundred feet apart and 175 feet high.

Placed upon a point of land at the most easterly portion of the Atlantic coast in this country, our advantages for radio communication are many. Unhindered by amateurs or induction from outside electrical appliances, with a wide scope of water range, this station has flashed its messages from Maine to Panama, and from points beyond the Great Lakes to many hundreds, even thousands, of miles at sea.

Grouped together are the dwelling, office and engine houses. To the rear is the oil house, where several hundred gallons of gasoline are stored and carefully guarded to prevent explosions. The engine house contains two engines, generators, switchboard, extra supplies, and a various assortment of tools used in machine, plumbing, electrical and carpenter work. The office building is divided into three rooms: office and operating room, battery room, and a third containing the transmitting apparatus. The Marconi Company have spared neither expense nor

effort to make the operators comfortable and contented. When the new dwelling house, now in course of construction, is completed, we shall have all the comforts of modern homes.

The house is divided into two apartments, each apartment having two bedrooms, living room, dining room, kitchen, pantry and bath room. The kitchen and bath room are to be supplied with running water and the entire house equipped with electric lights, electric fans, and suitable heating appliances. A five thousand gallon cistern will keep the operators constantly supplied with filtered drinking water. With the doors, windows and porch screened, the pleasant evening sea breezes may be thoroughly enjoyed in summer by Marconi men detailed at this picturesque spot without being annoyed by mosquitos and other insects.

VESSELS EQUIPPED WITH MARCONI APPARATUS SINCE THE MARCH ISSUE

Names	Owners	Call Letters
S. Y. Alberta	Commodore Frederick Gilbert Bourne	KZA
Tug Astral	Standard Oil Co. of New York	KSA
Tug Security	Standard Oil Co. of New York	KSJ
Evangeline	Canada, Atlantic & Plant Line	KII
J. A. Moffett	Standard Oil Co. of California	WRE
Balboa	American Steamship & Trading Co.	WHU
Despatch	Border Line Transportation Co.	WOA

THE SHARE MARKET

New York, March 19.

While the brokers report recent trading very quiet they maintain that there is abundant evidence of a revival of interest on the part of the public and are hopeful of an increased measure of activity. Ordinarily a dull market is a sagging one but Marconi quotations remain firm and strong with slight advances in English issues.

Bid and asked prices today:

American, 2⅜—2¾; Canadian, 1⅛—1½; English, common, 9—12½; English, preferred, 8½—11.

MARCONI ANNUAL MEETING

It is announced that the annual meeting of the stockholders of the Marconi Wireless Telegraph Company of America will be held on April 19, 1915, at 12 o'clock noon, at the office of the company, Hudson County National Bank Building, Nos. 243 and 245 Washington Street, Jersey City, N. J. (office of New Jersey Corporations' Agency), for the purpose of electing a Board of Directors and receiving and acting upon the reports of the officers, and for the transaction of such other business as may lawfully come before the meeting.

In accordance with the laws of the State of New Jersey, no stock can be voted on which has been transferred on the books of the company, within twenty days next preceding this election.

SHIP STATION NOTES

The steam yacht Alberta has been equipped with the latest type Marconi 2 k. w., 500 cycle quenched gap set. Commodore Bourne, her owner, took considerable interest in the installation of the equipment.

The steamship Evangeline, which is owned by the Canada, Atlantic & Plant Line, has changed from British to American registry and is now in the trade between New York and Bermuda. The call letters KII have been assigned to Evangeline.

The steam yacht Solgar, owned by W. W. Near, has accepted American registry. She has been renamed Zara. Her new call letters are KZI.

OPERATOR DISMISSED

An operator attached to the Eastern Division of the Marconi Wireless Telegraph Company of America was recently dismissed from the service for violating regulation 48, which forbids the pooling or raffling off of messages.

IN THE SERVICE

John B. Elenschneider was imbued with the ambition to become a Marconi man when he was an instructor in the naval telegraph school in Germany. The Belgian company, which he aimed to join, required that applications to enter its service should be written in English, and Elenschneider, not being well versed in that language at the time, was in a quandary. So determined was he to carry out his plans, however, that he obtained an English dictionary and, with this at hand, began to write the application. How much time the task consumed he does not relate, but he gained his object, becoming an employee of the Belgian Company in 1907.

He was born in Munich, Bavaria, thirty-two years ago, and was educated in that city and Regensberg. He afterward lived in turn in Leipzig, Berlin and Hamburg. While he was in the latter city he was drafted into the German navy, being assigned to the telegraph detachment. He served two years and was then transferred to the telegraph school, in which he was appointed an instructor.

After he had joined the Belgian Company he was detailed as a second operator on the Kaiser Wilhelm II. He was on this craft during two voyages, afterwards being placed in charge of the wireless on the Kaiser Wilhelm der Grosse, the Kronprinz Wilhelm and the Amerika. Later he was assigned to the Berlin. His next detail was on the Themistocles, a Greek steamship, bound on a sixty-two days' voyage to various Mediterranean ports. The vessel had not been long on her cruise when she ran into heavy weather, causing her to roll and pitch so that it was impossible for the cook to prevent the contents of kettles and pans from spilling. Boiled eggs occurred to him as the only solution of the difficulty and accordingly he served them three times a day for four days.

Elenschneider joined the American Marconi Company on March 12, 1910. For a time he was employed in the company's shops in New York City, making, installing and testing apparatus. Then he made a trip on the private yacht of Timothy Eaton, of Toronto, to supervise the operation of a new equipment. On his return to New York he engaged in engineering work, being sent to the Wellfleet station later as manager. He remained at Wellfleet for about six months when he returned to New York to take up his duties in the engineering department.

He designed a ¼ k.w. suit case set consisting of a sending and receiving apparatus mounted in a suit case in 1913. He afterward designed a ½ k.w. quenched gap panel set, a number of which were purchased by the United States Government for submarine and torpedo boat destroyer installations. This type of apparatus is now used on passenger and freight vessels as an emergency set and on smaller craft as the main apparatus. It is considered the most efficient set in the market for its size and power.

In addition to the various activities and accomplishments which have been mentioned Elenschneider also found time to install the equipment in the high power station of the United Fruit Company in New Orleans and to make an extended inspection of the Marconi stations on the Atlantic coast.

Marconi Men

The Gossip of the Divisions

Eastern Division

J. A. Bossen has been relieved on the Nuecess by R. C. Thomas, Bossen taking up the duties of second operator on the Brazos.

L. R. Rogers has been promoted and is now senior operator on the Maracaibo.

Henry Markoe is now senior on the El Rio.

W. S. Fitzpatrick has resumed duty on the Momus, which has been placed in commission. Brundage is again first on the Morro Castle. A. E. Voightlander has been appointed second.

W. A. Hutchins, of the Marconi School of Instruction, who was formerly employed on the Great Lakes, has been assigned as junior on the Tennyson. J. C. Stuart is senior.

W. S. Wilson has relieved Paul Nisley on the Jefferson. Nisley is on sick leave.

A. E. Wells and W. R. Wright have relieved M. W. Grinnell and A. E. Ericson as senior and junior respectively on the City of Macon.

D. Duffield and W. Kay have been transferred from the Coamo to the Carolina. Duffield is senior.

J. R. Conway, he of the pleasant smile, is now junior on the Momus. P. K. Trautwein has taken his place on the Arapahoe.

R. S. Balzano has been reengaged and is now junior on the Cherokee.

Operator W. E. Bisgrove, of the Korona, was suspended for delaying the sailing of the steamer to which he was detailed.

R. Pettit is now senior on the Korona. Kavanaugh is junior.

L. J. Michaels and C. A. Werker have been transferred, each taking the other's ship. Michaels is now senior on the Sabine and Werker is senior on the Jamestown.

A. H. Rettstatt is no longer in the service. M. B. Berger has succeeded him as senior operator on the Lenape.

C. V. MacPherson is now on the S. V. Luckenbach which is only carrying one operator.

Sidney Hopkins will be at the key when the Seguranca sweeps down the bay and turns her bow towards the troubled European shores.

J. L. Lynch, of the Trans-Oceanic Division, has been assigned as junior on the Byron. H. B. West is senior.

H. E. Cohen has been transferred from the Gulfoil to the El Oriente where he will be senior man.

C. L. Whitney, senior on the Seminole, has married and left the service.

F. J. Schmitt is no longer in the service.

The Evangeline has replaced the Oceana in the Bermuda run and L. R. Schmitt has been placed in charge of the wireless. W. F. Dillon is assistant.

P. Hebden has been promoted and is now senior on the City of St. Louis. M. Svendsen has succeeded him as junior on the Proteus.

J. R. Churchill and A. E. Ericson, lately attached to the Boston office, have been assigned as first and second respectively, to the Coamo.

Stanley Patten has been transferred to the Siamese Prince. P. W. Harrison has succeeded him as junior on the Philadelphia of the Red D Line.

G. P. Hamilton has been transferred to the Guiana as senior operator.

W. Lillis and C. L. Hardy have been assigned to the Matura as senior and junior respectively.

Earl Thornton has been transferred to the Crofton Hall.

F. R. Smith is off the Florizel and has been assigned to the Princess Anne. The Florizel is going to the ice fields and requires but one operator. T. A. Tierney sailed with her.

F. J. Klingenschmitt, one of the most popular men at Cliff Street, has accepted the position of operator on the S. Y. Owera, which is bound for San Francisco.

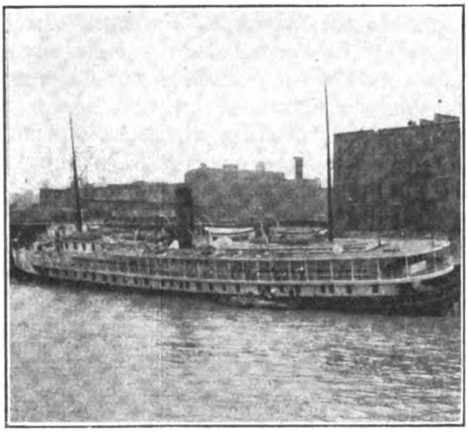
Southern Division

Operator W. E. Neumann, who recently recovered from an attack of pneumonia, has been assigned to the Parthian. The Parthian, which was laid up for several months, has again been placed in commission.

W. P. Kelland was recently assigned to the Ontario as senior operator in place of H. J. Sacker.

Junior Operator Brannan has been transferred from the Powhatan to the Parthian, on which he is now senior operator.

Operators McKiernan and Crone were transferred recently from the Essex at Norfolk, Va., to the Denver, in place of Operators Wilson and Adelberger. The Denver steamed for Bremerhaven. Senior Operator Fricke has been transferred from the Powhatan to the Essex in place of McKiernan.



Previous to the accident in which Operator Keefe figured, the Iowa was damaged in a collision. This photograph shows her after the accident

Operator H. G. Helgeson has been assigned to the Gloucester as junior operator, relieving Operator Murphy.

Junior Operator G. W. Baude was recently assigned to the Suwanee, relieving Operator Osterloh, who is now attached to the Essex as junior operator.

G. H. Fischer of the Dorchester was recently assigned to the Georgiana, at Charleston, S. C.

W. S. Fithian was recently assigned to the Dorchester as junior operator,

George Keefe, Marconi operator on the steamer Iowa. In order to send the S O S he remained at his post on the vessel when she was crushed in the ice in Lake Michigan until five minutes before she sank

Singewald having been appointed senior operator.

Operator William Lillis of the C. A. Canfield was recently relieved at Baltimore by P. Daniels, who came up from the Gulf of Mexico on the Canfield. Daniels was formerly attached to the Wakiva, which went ashore in the Gulf.

Junior Operator Naber recently returned from sick leave and was assigned to his former ship, the Merrimack, relieving Operator Osterloh, who was detailed to the Essex as junior operator. Naber says he will wait until next month before he asks off on sick leave again.

The Northern Pacific made her official trial trip off the Delaware Capes, starting February 26th and ending

March 1st. Operator G. W. Kelley of the Persian, was assigned to the Northern Pacific for the trial trip as senior operator. S. Rice was detailed as junior operator.

Operator R. Marsano was recently assigned to the Persian, relieving Operator G. W. Kelley.

Senior Operator Dudley and Junior Operator Haig have been transferred from the Indian to the Powhatan. The Indian has been laid up indefinitely.

The Suwanee has been transferred from the Baltimore-Jacksonville run to the Philadelphia-Jacksonville run until further notice.

The Georgiana was recently equipped by Constructor Murray at Charleston, S. C., with a ½ k.w. panel set.

C. H. Warner, who recently made a trip to Holland on the Rondo, returned to Baltimore on the first of the month.

Pacific Coast Division

From the Elks Club at Phoenix, Ariz., Ray Travers, an old-time operator, writes as follows: "Just finished reading my last 'Service.' Some magazine! It's worth the price to any of the old boys who still now and then, as I have just done, allow the four walls that surround them to fade away, and once again pass through the old days." Here is another of the old "Boys" who enjoys reading the little book.

On the last voyage of the Washingtonian from San Francisco to New York, via Seattle and Honolulu, Operator A. H. Randow was in almost continuous communication with the Pacific Coast stations until the ship was over 2,000 miles southeast of Honolulu.

P. Finnell has been assigned to the Adeline Smith.

R. F. Harvey, who was temporarily assigned as assistant on the Admiral Farragut, was relieved at Seattle on March 5th by E. C. Nelson, the regular operator.

P. J. Townsend, of the East San Pedro station, made a flying trip to San Francisco on the Governor recently, returning to San Pedro on the Aroline.

H. Hatton, formerly of the Queen, has been transferred to the Admiral Schley. Operator G. J. Schmeling is acting as assistant.

T. A. Churchill relieved Operator A. A. Beck as assistant aboard the Bear on March 7th.

J. L. McCargar has been assigned to the F. H. Buck.

S. Gasky has been temporarily assigned as assistant aboard the Congress.

W. Chamberlain has been assigned as operator in charge of the Columbia.

R. C. Camp filled in aboard the Topeka for one trip from March 5th to 8th, being relieved on the latter date by J. H. Southard, of the Governor.

B. C. McDonald of the Hermosa recently relieved Townsend at the East San Pedro station for four or five days. He then joined the Aroline temporarily.

E. A. Werner, after an enjoyable vacation, recently joined the Grace Dollar, vice W. D. Collins, resigned.

R. E. Smiley of the Georgian extended his distance work on the last trip from San Francisco to New York, via Seattle and Honolulu, working nightly with the Pacific Coast stations practically until the ship's arrival at Panama.

F. W. Shaw and C. Thomas were temporarily assigned to the Governor on March 7th.

E. Smith, acting assistant on the Great Northern, for the excursion to the Hawaiian Islands, will resume his position aboard the Wilhelmina.

H. G. Austin and A. F. Pendleton recently left with the Honolulian for New York.

J. A. Falke has been temporarily assigned to the Hermosa. He is expected to join the Santa Cruz at San Pedro bound for New York.

R. Baer relieved A. E. Evans as assistant aboard the Klamath on March 1st. The Klamath is making her first voyage to Mexican ports.

G. Crous and J. F. Woods left on the Manchuria as first and second operators respectively February 27th, Woods returning to his former position, after a short vacation.

O. B. Mills and W. H. Leland have been on the Multnomah, as first and assistant, since February 17th.

F. A. Lafferty recently sailed as assistant on the Manoa.

J. W. Morrow was assigned to the new Standard Oil ship J. A. Moffatt on March 1st.

P. E. Weymouth was temporarily assigned to the Norwood, March 4th.

D. R. Clemons and P. E. Riese recently sailed as first and second respectively aboard the Pennsylvania.

B. H. Linden has been assigned as assistant on the President.

O. Treadway and F. Deckard sailed as first and assistant on the Queen, March 3rd.

H. R. Davis and L. O. Marsteller left on the San Jose as first and assistant respectively March 5th, for Panama.

F. W. Harper was temporarily assigned as assistant aboard the Santa Clara on the San Francisco-San Pedro run recently.

G. J. Oschman was assigned as operator of the Grace steamer Santa Clara at New York recently, vice H. W. Sinclair.

K. D. Noble joined the Willamette as assistant March 6th, vice R. Alter.

S. Rudonett was temporarily assigned in charge of the Yosemite recently.

Seattle Staff Changes

Walter Chamberlain has been transferred from the Admiral Evans to the Columbia, and will make a voyage to South America.

E. C. Nelson has been temporarily relieving on the Admiral Evans and will return to the Admiral Farragut next voyage, having been replaced on the Evans by Operator R. F. Harvey, of the Southern Division.

Jack Carlson has been transferred from the halibut schooner Independent to the big schooner Windber.

M. Musgrave of the Dora has resigned.

R. Ticknor has been transferred from the City of Seattle to the Santa Catalina, which had been completely rebuilt, following a disastrous fire on the Columbian last year. He makes his first trip to the Atlantic.

H. W. Barker of the Bolinas high-power station is temporarily filling in as first on the Spokane, in order to be near his home during the illness of his mother.

A. G. Simson of the City of Seattle was recently transferred to the Spokane because of the lay up of the former vessel.

P. M. Jacobson is on a vacation, following the lay up of the Zapora.

G. W. Woodbury, who has returned to civilization after twelve months' service on the Dora on the Westward run, is on a vacation.

William Johnson was recently transferred from the Alki to the Despatch as purser and first wireless operator, with Roy Wood as his assistant.

H. Painter of the Admiral Watson has resigned. He has been succeeded by A. E. Marr.

M. Obradovic and J. F. Hammel are on the Pavlof, which was formerly called the A. G. Lindsay.

P. J. Smith, third trick at Astoria, has resigned, having been relieved by L. A. Lovejoy, of Hanalei fame.

The installation of the 5-K. W. equipment in the Seattle station is almost complete. New records are expected with this fine equipment.

C. B. Cooper, chief operator, has resigned. G. A. Nicholson, who was formerly station manager at Seattle, is acting chief operator. J. A. Marriott, first on the Congress, has been detailed temporarily in the Seattle station.

WIRELESS SPEEDS REPAIRS

The steamship San Jose became disabled on February 14, 121 miles south of Acapulco, Mexico, and the Marconi operator on board sent out a wireless appeal for aid, getting into communication with the New Orleans and the Santa Rita, which came to her assistance. The San Jose was towed into Acapulco where arrangements had been made by wireless to make the necessary repairs, which were completed by February 17. The vessel was delayed but fifty hours as a result of using wireless to summon aid and facilitate preparations for repair work.

INSPECTOR WOOLVERTON IN N. Y.

R. B. Woolverton, radio inspector in the service of the United States Department of Commerce for the port of San Francisco, was in New York City recently.

Queries Answered

Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of an individual can be answered. To receive attention these rules must be rigidly observed.

Positively no Questions Answered by Mail

C. P., Stege, Cal., writes:

Ques.—(1) Please tell me how a ground connection is made on a wireless station when it is used on an aeroplane.

Ans.—(1) There are two methods of making an effective earth connection for an aeroplane. One is to use the frame if of metal, or the truss wires of the machine itself. Another is to drop a wire downward from underneath the aeroplane after the machine is in the air. This wire is generally held taut by a small weight on the end. You, of course, are aware that at any wireless station an artificial capacity may be used in place of the earth. While this is not as effective as an actual earth connection, still it gives some results. These artificial balancing capacities are known as counterpoises. You should understand that if the counterpoise is a few feet above the earth the antenna is effectually grounded, the counterpoise constituting one side of the condenser, the earth the other side.

Ques.—(2) What is the approximate wave-length of an aerial of 4 wires, 90 feet in length and 40 feet in height at both ends?

Ans.—(2) Two hundred and thirty meters.

Ques.—(3) What are the meanings of the abbreviations, SUC and DA?

Ans.—(3) There has been some error in reading these signals; there are no such abbreviations.

* * *

J. E. D., Philadelphia, Pa., asks:

Ques.—(1) Please tell me if it is legal for an individual to set up and use for commercial purposes, a wireless transmitter thus: plain gap, rotary gap or compressed air gap, plate condensers, etc.

Ans.—(1) It is legal to set up a station for commercial purposes provided the owner is licensed by the United States Government. Keep in mind, however, that the basic patents in wireless telegraphy are fully controlled by the Marconi Company and that an offender is liable to suit for infringement. You cannot operate such a station without a license from the Marconi Company.

Ques.—(2) In a recent discussion I held that anyone disclosing the contents of an amateur's message was liable to prosecution. Is this quite right?

Ans.—(2) Yes, you are right. The amateur stations in this respect come under the same restrictions as the commercial stations.

* * *

C. C. A., Worcester, Mass., writes:

Ques.—(1) I am now using a 2,500-meter 3-slide tuning coil. Would the strength and range of signals be increased or not if I should change to a "loose coupler"? My present range is fairly good as I can receive NAA at noon using an indoor aerial.

Ans.—(1) No particular increase in the strength of signals would be produced. As a matter of fact in many cases better signals are obtained with direct coupling than with inductive coupling. Of course the inductively-coupled receiving tuner allows a quick change of the value of coupling which is not so readily obtained with the direct type.

Ques.—(2) If I use my present coil as a secondary and make a primary, 3¾ inches by 11 inches, wound with No. 26 D. S. C. wire to go with it, what would be the approximate wave-length? The present coil is wound with No. 30 bare wire on a cylinder 3 inches by 11 inches.

Ans.—(2) Using the present three-slide tuning coil as a secondary winding, the range of wave-lengths to be expected would depend entirely upon the capacity of the condenser to be placed in shunt. If this coil were shunted by a condenser of the Murdock type having a capacity of 0.001 mfds., it would give a range of wave-lengths up to about 5,500 meters, possibly a little more. The range of wave-lengths to be expected in the antenna circuit would depend entirely upon the wave-length of your aerial and, lacking data in this respect, we cannot answer.

* * *

S. S. G., Champaign, Ill.:

We have no data at hand for a step-down transformer as requested in your first query.

In answer to your third query we would say that we are inclined to believe that for the telephone set described in the August, 1914, issue of The Wireless Age, a transformer with a 2,000-volt secondary might, in some respects, be better for the work than one giving 14,000 volts. This, however, is best determined by experiment. The operation of a wireless telephone set on alternating current at the best is not very satisfactory.

L. C. G., Mattituck, N. Y., writes:

Ques.—(1) On the train dispatching wire of the Long Island Railroad, which is a telephone system known as the "Gill Selector," it is possible during the winter months to hear NAH, the Brooklyn Navy Yard wireless station. The signals are quite weak and at times hardly readable. These signals can be heard at any railroad station on the line, which is a hundred miles long. The nearest distance from the Brooklyn Navy Yard to this train dispatching telephone is five miles. Kindly explain how this takes place.

Ans.—(1) Even though the train dispatcher's telephone is five miles from the Brooklyn Navy Yard, we are inclined to believe that it is the electro-static induction from the Navy Yard which is influencing the telephone line. Perhaps other wires running near the Navy Yard receive some of this electro-static energy and transfer it to the telephone lines of the Long Island Railroad. This is not surprising, as it has been noticed years ago on other telephone lines.

* * *

A. A. H., Chicago, Ill., asks:

Ques.—(1) Is WSL (Sayville station) transmitting at the present time, and if so, on what wave-length and at what hours? I have been unable to hear them for about three weeks, although the signals of stations farther away, Cape Cod, for instance, come in good.

Ans.—(1) The Sayville station is still operating every night on the regular schedule but on a longer wave-length—about 4,000 meters.

Ques.—(2) Is the new transmitting station at Belmar in operation yet and if so, when does it work and on what wave-length? Can the signals be read with the ordinary wireless receiving sets that will tune to that wave-length?

Ans.—(2) The stations at Belmar and New Brunswick are not in operation, having been closed on account of the fact that the corresponding stations in Europe have been taken over by the British Admiralty. You will not be able to read the signals from these stations when they are in operation because automatic transmission at a speed of 75 words per minute will be employed.

* * *

A. J. N., Cleveland, Ohio, asks:

Ques.—(1) What is the wave-length usually employed and what kind of transmitting sets are installed in the Clifden (Ireland), Eiffel Tower, and POZ stations?

Ans.—(1) The normal wave-length of the Clifden station is 6,800 meters, but may vary at certain periods when working with the Admiralty war ships. The wave-length of the Eiffel Tower station, for press matter, is 2,500 meters. We have no record of the wave-length used for other work. POZ is the German Government station at Nauen, Germany. The wave-length used is 9,400 meters. The Clifden station employs a transmitting set having a non-synchronous rotary spark discharger, giving a spark note equivalent to about a 300-cycle source of supply. The energy for charging the condensers is supplied by 7,000 storage cells, giving a potential of 14,000 volts. We have no distinct data on the Eiffel Tower station, but understand that no apparatus out of the ordinary is employed. The station of the German Government at Nauen uses the Count Arco step-up transformer system for generating undamped oscillations. These signals cannot be heard in the United States without the use of special receiving circuits. In other words, you must employ receiving apparatus suitable for the reception of undamped oscillations.

Ques.—(2) What time of day or night do these stations work with corresponding stations in the United States?

Ans.—(2) The Marconi high power station at Clifden, Ireland, maintains a 24-hour schedule with Glace Bay, Nova Scotia. The Eiffel Tower station does not work with stations in this country. The station at Nauen sends press matter and messages to Sayville, L. I., at certain intervals. We have kept no record of the actual sending time.

Ques.—(3) What would be the best detector to use in order to copy these stations?

Ans.—(3) Apparently you have not had much experience with wireless telegraph apparatus. For all this work a detector of the valve type should be employed, but the manner in which it is used for the reception of undamped oscillations is quite different than that employed for damped oscillations. The details of circuits applicable are not available for publication at present for the reception of undamped oscillations. It is difficult for one who has not had considerable experience in wireless telegraphy to manipulate apparatus of the type necessary for this work.

* * *

W. O. W., Los Angeles, Cal., asks:

Ques.—(1) Can a 500-cycle generator of the proper size to supply a ½ k.w. or 1 k.w. transformer be constructed cheaply?

Ans.—(1) This is a matter which can only be handled by a competent designing engineer who has had considerable experience. Unless you have had some training along these lines you had better not attempt the construction of such a generator; furthermore, it would cost you considerably more than it would one who had the proper facilities for this work.

Ques.—(2) What would be the dimensions of such a generator?

Ans.—(2) We have no data at hand. This is somewhat out of the field of matters covered in this department.

We have no data on the transformer as requested in your third query.

We have no data upon the rating of N. F. L.'s transformer. You had better communicate with this naval station direct.

* * *

E. D. H., Philadelphia, Pa.:

We can answer none of the five queries sent in your recent inquiry. You have not given us the diameter of the tube on which the windings are to be made.

J. S. D., Brooklyn, N. Y., asks:

Ques.—(1) Will you please tell me how to calculate the approximate wave-length of an aerial?

Ans.—(1) This matter has been fully covered in previous issues of THE WIRELESS AGE in this department. It is possible to handle the matter mathematically, but the equations are generally beyond the amateur experimenter.

Ques.—(2) About how far should the wires of an aerial be placed to obtain the best results?

Ans.—(2) The wires should be separated from two to three feet.

Ques.—(3) How much current should be used in connection with the Fleming oscillation valve detector?

Ans.—(3) It depends entirely upon the size of the valve, some of which were made for 6 volts and others for 12 volts. The maximum value of current consumed generally is not more than 1/2 ampere.

* * *

J. F. S., Paterson, N. J., writes:

Ques.—(1) My aerial is 80 feet in length, consisting of four wires spaced two feet from center to center; the flat top portion is 45 feet in height, and the lead-in is about 40 feet in length. The ground wire is 16 feet in length and consists of three No. 16 tapper wires.

The apparatus is as follows: 1 "loading coil" 14 inches in length by 3 1/4 inches in diameter. It is wound full of No. 22 enamelled wire. It also has a double slide tuner 15 inches in length, 3 1/2 inches in diameter, wound full of No. 22 enamelled wire. I have a variable condenser that consists of nine brass plates 4 by 6 inches, No. 22 gauge; five stationary plates, four movable plates. I use a galena detector, fixed condenser and two 1,000-ohm head telephone receivers (Brandes). What is the wave-length of the aerial (which, by the way, is of the inverted L type)? Also what is my receiving range, day and night?

Ans.—(1) Your aerial has a natural wave-length of 215 meters. Your receiving range depends entirely upon the station from which you desire to receive. While the tuning coils as described will allow your aerial circuit to be adjusted to very long wave-lengths, still we cannot guarantee any degree of efficiency. You should be able to hear the Key West (Fla.) naval station; the Arlington station, and stations situated on the Atlantic Coast and the Gulf of Mexico. The double slide tuner would probably give better results if it were wound with finer wire, say No. 26 or No. 28, F. S. C. Your equipment as described will allow you to adjust to wave-lengths between 5,000 and 6,000 meters.

Ques.—(2) Please advise me regarding the dimensions of and size of wire for an inductively-coupled receiving tuner to receive long wave-lengths to be used with the aerial referred to.

Ans.—(2) See the article in the February issue of THE WIRELESS AGE entitled "How to Conduct a Radio Club." Also the Queries Answered department in previous issues of this magazine. Your aerial is too short for the efficient reception of long wave-lengths. It should be at least 1,000 feet in length.

Ques.—(3) I have a 2-inch spark coil. Will a 6-volt, 60-ampere-hour storage battery be sufficient to run the coil? Also what quantity and size of glass plate will I require to make a sending condenser to be used with the 2-inch coil?

Ans.—(3) Better results will be secured with an 8 or 10-volt battery. It is rather difficult to advise the exact capacity of a condenser suitable for this coil. In the November, 1913, issue of THE WIRELESS AGE a condenser suitable for a 3-inch spark coil was described. A condenser for this coil should have a capacity of not more than .002 microfarads. Four glass plates, 8 by 8 inches, covered with tin-foil 6 by 6 inches and connected in parallel will give the desired capacity.

Ques.—(4) Kindly give me the dimensions for a helix or oscillation transformer so as to enable me to keep within the law.

Ans.—(4) This transformer is principally of the inductively-coupled type, but owing to the fact that we do not know the exact value of condenser capacity which you expect to employ with this transformer, we cannot give accurate dimensions. Also we should require to know the inductance and capacity of the antenna with which it is to be employed. See the November, 1913, issue of THE WIRELESS AGE; also the Experimental Department of THE WIRELESS AGE. Several types of oscillation transformers suitable for amateurs' use have been described in previous issues.

* * *

W. N. P., Washington, D. C., asks:

Ques.—(1) What is the natural wave-length of an open "T" flat top aerial, consisting of four No. 14 bare copper wires, 60 feet in length, 50 feet above the ground on one end, 45 feet on the other?

Ans.—(1) The natural wave-length of this aerial is about 195 meters.

Ques.—(2) Please give data for the construction of a 1/2 k.w. induction coil, to be used with a magnetic interrupter on 110-volt D. C. If there is no advantage in using 110-volt please state how many dry cells will be required.

Ans.—(2) The following dimensions are applicable to the coil as requested: Length of the primary coil in inches, 24 inches; diameter of the coil, 3 inches. This core should be wound with 400 turns of No. 12 D. C. C. wire. The primary winding should then be covered with a micanite tube 1/8 of an inch in thickness. The secondary winding should consist of 16 sections of No. 28 B. and S. gauge wire. You may use enamelled wire or double covered wire. The secondary wire will have an approximate diameter of 11 inches. The condenser to be connected across the interrupter should have approximately 10,500 square inches of coil.

As dry cells will soon become exhausted you should, if possible, employ from 40 to 50 volts of storage battery current. If this coil is used in connection with 110-volt D. C. current you will require a rheostat in series with the primary winding. Generally speaking, you will find it about as cheap to purchase a coil of this type as to construct it yourself.

Ques.—(3) Could I construct a "loose coupler" or tuning coil to be used without an aerial to read the signals from Arlington? My station is located only six miles away. What dimensions and what size of wire would you suggest?

Ans.—(3) Whether used with or without an aerial, it would have no effect on the construction of the loose coupler, particularly the dimensions of the secondary winding. We suggest that you use an indoor aerial made up of three or four hundred feet of annunciator wire, winding it up in the form of a spiral on the ceiling of your room. This aerial is then connected to the receiving tuner in the regular manner. Previous issues of THE WIRELESS AGE have contained considerable data on receiving tuner windings suitable for the reception of signals from the Arlington station. If you build a tuner of these dimensions you should have no difficulty in hearing the desired station. Perhaps you may find it necessary to use a loading coil in series with the spiral antenna. This is best ascertained by experiment.

* * *

F. W. D., Hamilton, Ohio, inquires:

Ques.—(1) I understand that WSL (Sayville, L. I.) sends on a wave-length of 2,800 meters, but according to my wave-meter he sends on exactly 4,000 meters. I copied NAA (Arlington, Va.) on 2,000 meters, but sometimes on a wave-length as low as 1,860 meters. Am I wrong or is the wave-meter at fault? The meter is of the Clapp-Eastham type.

Ans.—(1) We are inclined to believe that the wave-meter is at fault. The wave-length of the Arlington station when sending the time signals is 2,500 meters. The station at Sayville has three distinct wave-lengths which may be employed; one of 2,800 meters, the next 3,500 meters and the last 4,800 meters. Of late this station has been employing a longer wave-length, principally the 4,800-meter wave. Apparently your wave-meter is reading about 800 meters short.

Ques.—(2) What size and what gauge wire on the primary and secondary windings should I use to get WII (New Brunswick, N. J.)? My aerial consists of 4 wires 165 feet in length, 100 feet in height, the wires spaced 3 feet apart. I expect to shunt the primary and secondary windings with Blitzen 31 plate condensers and will employ a crystal detector.

Ans.—(2) The data given in the article on "How to Conduct a Radio Club" in the February, 1915, issue of THE WIRELESS AGE is just what you require. Your aerial is rather short for the reception of very long wave-lengths. It should be at least 1,000 feet in length for efficient results. The New Brunswick station of the Marconi Company is not in operation.

Ques.—(4) What should be the diameter and length of the tubes for the tuner referred to? I have on hand some tubes 4½ inches in diameter that I should like to use for the primary and some 3¾-inch tubes for the secondary. I should like to use single silk-covered wire.

Ans.—(4) If you employ a 4½-inch tube for the primary winding, it should be at least 26 inches in length and wound closely with No. 22 wire, the actual length of course depending upon the size of the aerial. The secondary winding may be made on the 3¾-inch tube and should be wound closely with No. 32 wire. It may be 20 inches in length. We suggest, however, that you construct a secondary winding similar to the one described in the article on "How to Conduct a Radio Club" in the February issue.

Ques.—(5) I have a 5 k.w. open core transformer giving about 35,000 volts. What size condenser should I use? I have on hand some plates 18 inches by 24 inches ¼-inch in thickness. My oscillation transformer has 25 turns in the primary winding and 60 in the secondary winding. I have a permit to use the apparatus.

Ans.—(5) We infer that this transformer is to be used in connection with a 60-cycle source of current supply. And, if it is to be employed with a plain spark discharger, the condenser should have capacity value of 0.06 microfarads. If you use a series parallel connection of the condenser plates of the size given you require 18 plates covered with tinfoil on either side, having dimensions of 14 inches by 20 inches. But inasmuch as the potential of your transformer is rather high for this glass, you should employ series parallel connection. You will therefore require 72 plates, 36 plates in each bank connected in parallel and the two banks of 36 connected in series. This will reduce the potential strain on each bank to 17,500 volts. Had you given us the dimensions of your oscillation transformer, the spacing between the turns, diameter, etc., we might have been able to give you a fair idea of the wave-length you may expect in the spark gap circuit. If you employed no more than 4,000 centimeters of inductance in the primary winding of the oscillation transformer, the condenser as described would give a wave-length value of 930 meters. For resonance you therefore require a loading coil in series with the antenna circuit. You should be able with this set to produce a considerable disturbance in the ether about your station. But if you use the full capacity of this transformer, you should enlarge your aerial.

* * *

E. C., Falmouth, Mass., inquires:

Ques.—(1) I have constructed a spark coil as follows: The primary winding consists of two layers of No. 14 D. C. wire, wound on a fiber tube 13 inches in length, 1 inch diameter, having 330 turns. The secondary winding consists of 5 pounds of No. 36 double silk covered wire wound in three sections.

I have tried it out on seven dry cells with a vibrator and I can only get a ½-inch spark. What is the trouble with this coil? What sized spark should I get, also how many dry cells should I use? Could I use this coil as a transformer and what would it require in kilowatts when used on alternating current?

Ans.—(1) The design as given is rather bad. What size spark did you expect to get from this construction? The design is also unsuitable as an alternating current transformer. We herewith give you dimensions of a 6-inch spark coil. The core should be 10 inches in length, 1¼ inches in diameter, and wound with 214 turns of No. 14 wire. The primary windings should then be covered with a micanite tube ⅛ of an inch in thickness; the secondary winding should consist of 5 pounds of No. 36 wire, made up in four sections. The sections will be approximately five inches in diameter.

Perhaps you would secure a better spark if you employed more energy in the primary circuit. Have you tried a storage battery of about 10 or 12 volts in place of the seven dry cells?

* * *

A. S., Jr., Brooklyn, N. Y., asks:

Ques.—(1) Please give dimensions for a four-inch spark coil for wireless telegraph work, the number of batteries required to operate it, and the approximate range with a 60-foot aerial.

Ans.—(1) Data for this coil is given as follows:

The primary core should be 8¾ inches in length, 1 inch in diameter and wound with 232 turns of No. 16 wire. The primary winding should then be covered with five layers of empire cloth. The secondary windings should consist of 2 pounds of No. 36 wire wound in 3 sections. The secondary windings will have an approximate diameter of 4 inches. The condenser connected across the interrupter should have 2,500 square inches of coil in the conductor.

Ques.—(2) I should like to use the sending condenser and oscillation transformer described in the November, 1913, issue of THE WIRELESS AGE. Furthermore, I should like to use a rotary spark gap made from a toy motor or a straight gap. Are there any objections?

Ans.—(2) You will find the operation of the rotary spark gap in connection with this coil very unsatisfactory, to say the least. You had better use the ordinary straight spark gap. There could be no advantage in using a rotary spark gap, for the note of the spark is already dependent upon the speed of the vibrator.

Ques.—(3) Will the oscillation transformer referred to be just as efficient if the secondary winding is arranged on a rod so that it slides backward and forward, as for example in the instruments sold by the Manhattan Electrical Supply Co.?

Ans.—(3) There is no objection to this construction; it affords a simple and easy means for regulating the value of coupling.

Ques.—(4) Please give the wave-length of the aerial referred to and instruments. Part of the aerial is not more than 4 feet above the tin roof at the closest point. The aerial is about 50 feet in height at the highest part, and 45 feet in height at the other end. The ground wire is 5 feet in length.

Ans.—(4) It is rather difficult to calculate the wave-length of an aerial disposed in this manner. The approximate value is about 190 meters. The tin roof has the effect of increasing the effective capacity. Of course this wave-length will be raised when the secondary winding of the oscillation transformer is connected. We should judge that the resultant wave-length will be in the vicinity of 235 or 240 meters.

* * *

R. G. D., Binghamton, N. Y.:

The natural wave-length of the first aerial you describe is about 320 meters. The wave-length of the second aerial is about 400 meters. Your receiving range with the apparatus described is about 200 miles in daylight and 1,500 miles after dark.

It is possible to take out a patent without the services of a patent attorney, but you will find it to your advantage to employ one, as they are more familiar with the technicalities of the procedure than you could possibly be.

You can secure a copy of the Naval Manual for 1913 by Commander Robson from the Secretary and Treasurer of the Naval Institute, Annapolis, Md.

* * *

T. G. F., Fort Totten, N. Y., asks:

Ques.—(1) Please furnish me with the specifications and directions for making an open core transformer (about ¼ kw.) to operate on 60-cycle, 110-volt A. C. current without any kind of an interrupter in the circuit.

Ans.—(1) The primary winding of this transformer should have an iron core composed of No. 30 iron wire in a bundle two inches in diameter. It should be 15½ inches in length covered with three layers of Empire Cloth and wound with two layers of No. 14 D. C. C. magnet wire. This winding should be 13½ or 14 inches in length. The primary winding should then be covered with a micanite or hard rubber tube. The secondary winding should consist of 10 sections, each 6 inches in diameter and 1¼ inches in thickness, separated by insulating discs ⅛ inch in thickness. It is wound with No. 30 S. S. C. wire.

Ques.—(2) What are the theoretical principles on which a tikker acts as a rectifier (if it does) in the secondary circuit of a receiving transformer?

Ans.—(2) The original Poulsen tikker does not operate as a rectifier, but simply as a circuit interrupter. The sliding wire type of tikker as described in the Queries Answered Department of a previous issue of THE WIRELESS AGE has been known to exhibit rectifying properties, but no proper explanation has been given therefor.

J. I. H., Harrisburg, Pa., asks:

Ques.—(1) What are the requirements to join the American Radio Relay League, and where can I get full information concerning the organization?

Ans.—(1) Communicate with the secretary, Clarence D. Tuska, Hartford, Conn.

Ques.—(2) Will an aerial consisting of six solid copper wires 300 feet in length (of the inverted L type), a loading coil 12 inches in length by 4½ inches in diameter wound with No. 24 silk wires and a loose coupler having a range of 2,000 meters be sufficient to allow the reception of messages from Glace Bay? The aerial is 70 feet in height.

Ans.—(2) You will not be able to reach the wave-length of the Glace Bay station with this apparatus. You have insufficient inductance in the antenna circuit, and you will not be able to adjust your secondary windings to this wave-length.

Ques.—(3) How far should I be able to send with the following apparatus: 1 ½ k.w. 13,200 volt transformer, rotary spark with 12 points on the rotor, speed 12,000 R. P. M. The condenser consists of 10 8 by 12 plates, coated with tin-foil. It is mounted in two sections, connected in series. The oscillation transformer is of the pancake type and the power transformer is operated by 110-volt, 60-cycle alternating current. The aerial is 70 feet in height and consists of 4 wires, 90 feet in length.

Ans.—(3) Your transmitting range is approximately 40 miles. We advise you not to stand in front of a rotary spark gap revolving at a speed of 12,000 R. P. M., particularly if it is of the construction generally found in an amateur station. Do you mean 12,000 R. P. M. or 1,200 R. P. M.? If the latter, the speed is too slow. The disc is preferably rotated at a speed of 2,400 R. P. M.

Ques.—(4) Do the angles at which the wires are bent, in passing from the instrument to the aerial and ground, cause any loss? Also, what size wire should be used in connecting the aerial to the instrument? How many strands of No. 14 wire should be used?

Ans.—(4) There is no loss in the angles unless very high potentials are employed, resulting in brush discharge. The connections from the aerial to your apparatus should be at least as large, or in other words, of the same capacity as the wires in the antenna itself. We advise at least 4 strands of No. 14 wire.

Ques.—(5) I propose to erect an iron pole 3 inches in diameter at the base, 2½ inches at the top, built in 4 sections, having a total height of 70 feet. What should be the size of the guy wires and how many should I use if the pole is to be placed 5 feet in the ground?

Ans.—(5) One set of guys connected to the pole 5 feet from the top should be sufficient to support this mast. You may use No. 8 iron wire for this purpose. The base should be sunk in concrete about three feet in diameter.

J. C. E., Melrose, Mass., asks:

Ques.—(1) Please tell me the natural wave-length of an aerial consisting of 2 wires spaced 4 feet apart, 100 feet in length, 35 feet in height at both ends, lead-in, 15 feet; the aerial consisting of No. 14 copper wire. If the wave-length of this aerial is more than 200 meters, about how much would I have to reduce it to bring it down to about 170 meters?

Ans.—(1) The natural wave-length of this antenna is about 250 meters. If you desire to reduce it to a wave-length of 170 meters, the flat top portion should not have a length of more than 68 feet.

Ques.—(2) I have some glass plates, 8 by 8 inches. How many will I require to be used in connection with a ¼ k. w. transformer, secondary voltage 13,200 and a rotary gap having 12 spark points. The disc is 5¾ inches in diameter and will have a speed of 3,000 R. P. M. The glass plates referred to are to be coated with tinfoil 6 by 6 inches. What would be the capacity of this condenser in microfarads?

Ans.—(2) The capacity of the condenser should be approximately 0.005 mfds. You will require 10 plates of glass 8 by 8 inches, coated with tinfoil 6 by 6 inches. These plates to be connected in parallel.

* * *

J. S. B. (no address):

We have read your communication carefully and advise that either one of the proposed aerials as shown in your sketch should assist in increasing the range of your set. Your original aerial is too small for long distance work and you should secure better results by either one of the two suggested. Nearby telephone wires are not always a detriment to the reception of wireless signals and may, in some cases, increase the energy—that is to say, a portion of the wireless energy picked up by the telephone wires may be reradiated and intensify the energy in the receiving aerial. The telephone wires themselves may often be used as a wireless telegraph aerial without interfering with telephonic conversation. In this case one end of the receiving tuner is connected to the telephone wire and the other terminal grounded through a condenser of, say, about 0.001 Mfds. capacity.

* * *

J. H., Los Angeles, Cal., writes:

Ques.—Kindly explain how it is possible to radiate energy on a wave-length of 50,000 meters when the oscillation frequency corresponding to this wave-length is only 6,000 per second (below the range of radio frequencies).

Ans.—We are not aware that a radiation takes place at such frequencies. We do not know of any experiments that have been conducted along this line. However, the experience of the Marconi Company would seem to indicate that radiation at such frequencies may be possible in the near future, for already successful experiments have been carried out at the wave-length of 16,000 meters, corresponding to an antenna frequency of 18,750, which is also below the range of radio frequencies and somewhat within the range of audition.

Wireless Time Signals and Longitudes*

By Arthur R. Hinks, M.A., F.R.S.

(Assistant Secretary of the Royal Geographical Society.)

IN the Year-book for 1913 we gave some account of the service of wireless time signals established at the Eiffel Tower, by the co-operation of the Paris Observatory, the Bureau des Longitudes, and the Commandant of the military wireless post installed at the tower. In the present article we will deal first with the arrangement of this time service in somewhat greater detail.

At 10:40 in the morning and at 11:40 in the evening the operator at the tower sends the call familiar to every owner of a receiver—the general call and the wait signal; he then switches over to the line connecting the post with the Observatory. Two minutes later the sapper telegraphist on duty at the Observatory sends the "*Paris Observatoire Signaux Horaires.*" He then takes his stand at a telescope in the clock room of the Observatory, and watches the dial of the standard mean time clock. At 10:44 he begins to send the first series of warning signals by hand, and as he finishes at 10:44:55 he switches the clock into the circuit. At 10:45 the clock itself sends the first time signal, a single rather long dot. The clock is then cut out, and at 10:46 the operator begins again with the second set of warning signals, proceeding as before to switch in the clock just in time to send the 10:47 signal; and so for the third set. Immediately after the last time signal at 10:49 the Observatory is cut off, and the operator at the tower sends out the weather report and forecast prepared by the *Bureau Central Météorologique*.

This morning and evening service of three single time signals is intended for the general use of all those who want the time with an accuracy of about two-tenths of a second—clock-makers, navigators, or field surveyors engaged on work of secondary precision. But the exactness with which these signals can be observed and compared with clocks or chronometers is not high enough for purposes of precision, and for these a special service is provided at about 11:30 each evening. The principle is that of the "*vernier acoustique.*" A clock at the Observatory, beating fifty in forty-nine seconds, is put into the circuit, and sends at each beat a very sharp signal, which in the telephone receiver is exactly like the tick of the clock to be compared with it. The comparison is made by the method of coincidences. The Paris signals gain rapidly on the clock, and the coincidence of beats can be determined to within about one beat, or a fiftieth of a second. During the space of nearly three minutes, or, more precisely, one hundred and eighty beats, that the signals last, there will be three coincidences; and the mean of the three gives a comparison which may be relied on to well within the fiftieth of a second, or well within the accuracy with which time can be determined and kept at a single observatory.

The theory of this method is simple. In practice it is not so easy to carry out, for one is very apt to lose count and become confused between the Paris clock and that which is compared with it. The series of 180 beats is broken into three by the suppression of the 60th and the 120th, which gives an opportunity for picking up the count after each coincidence. And there are various devices for counting and recording the corresponding beats and seconds which are fully

* Abstracted from "The Year Book of Wireless Telegraphy and Telephony, 1914"

explained in the second edition of the well-known pamphlet published by the *Bureau des Longitudes, "Réception des signaux radiotélégraphiques transmis par la tour Eiffel."* It will be enough to make here only two remarks. First, it is advantageous that the clock to be compared shall be heard, not directly, but in the telephone receiver; and the easiest way of arranging this is to make use of the fact that it will naturally be fitted with contacts for sending seconds to the chronograph. If the wire carrying these signals passes anywhere near the wireless receiver the ticks will be heard in the telephone. It is easy then to arrange that the observer shall have a resistance at hand to vary the strength of the clock signals and to cut them out at pleasure. The latter is essential. Until one has picked up the beats of the Paris clock the other should not be heard, or there may be confusion.

The second desideratum is a means of recording the signals automatically, instead of relying on coincidences determined by ear. At the Eiffel Tower station they have a beautiful arrangement of a photographically recording galvanometer, which catches the signals, and a mirror mounted on a tuning fork, which sends a second spot of light to the record to make a finely divided time scale. This is excellent as a laboratory method, but delicate for general use. A relay sensitive enough to record the wireless signals mechanically is wanted for this, as for all other operations of wireless.

We have still to explain how the observer is told the time of each beat of the *"vernier acoustique."* The series goes out at 11:30 in the evening. It is received at the Paris Observatory and compared with the standard clock. A few minutes' calculation gives the precise time of the first and last beats, and these are reported, to the hundredth of a second, in a wireless message sent out from the Observatory immediately after the evening set of ordinary time signals, at about 11:50 p. m.

In our article in the last Year-book we spoke of the proposed establishment of an international time service, to be maintained by an international bureau established in Paris. It was hoped that this would be in operation by the 1st of July, 1913. But progress has been slower than was anticipated, and neither the bureau, nor the revised system of sending the signals, nor the new hours for the signals are yet in operation. But meanwhile an interesting re-determination of the difference of longitude between Paris and Washington has been in progress, which has given valuable information as to the technical difficulties of a precise world-wide time service and determination of longitudes. The essential condition of the operation is easily stated. At a certain instant the clocks at Paris and at Washington are to be compared by the receipt at one of a wireless signal sent by the other, and the errors of both clocks on local time must be known with the utmost precision at the moment of comparison. Herein lies the first of the difficulties. The time is of course determined by star observations with the meridian circles of the two observatories. But the night may not be fine at both when the signals are sent. One must then rely upon the clock to carry forward the time quite uniformly, to bridge over the interval between the moment when star observations are possible and the moment when the signals are sent.

Secondly, if the time observations are really simultaneous, it means of necessity that different stars are observed; and any error in our knowledge of the relative places of those stars is reproduced with its full effect in the resulting difference of longitude. Or if, on the other hand, it is considered essential to get rid of this error by employing the same stars at both observatories, then the star observations are of necessity separated by an interval equal to the difference of longitude, and one must rely on a combination of the clocks to bridge the interval.

In trying to reduce the problem to its simplest terms, for the purposes of this statement, we have of course unduly simplified it. In practice the determinations of the clock error will be as continuous as possible at both stations, while the operations will extend over a long space of time, or will be repeated at intervals

throughout a whole year. Little by little the errors due to the want of precision in the star places, and the other errors due to the imperfect running of the clocks, will then be averaged out and eliminated. But there will remain the more recondite sources of error derived from the residual differences of personality of the observers with the transit instruments; the small unsuspected or imperfectly determined errors of the instruments themselves; not to speak of the probability that new sources of error, hitherto unsuspected, will be found when everything else has at great pains been eliminated. It is that possibility which lends a fascination to the employment of a new and precise method.

The performances of wireless have in fact for the moment outstripped the possibilities of instrumental astronomy. It is easier to compare the time at two stations than it is to determine it at either. Despite the introduction of the Repsold micrometer, which is supposed to eliminate the personality of the observer, there remains a certain small difference between the results of the transit observations made by different observers; while it is difficult for any astronomer, however well installed his transit instrument, to be certain that neither the errors of figure of his pivots, nor the residual instability of his azimuth, nor horizontal flexure and refraction, have vitiated the determination of his time by one or two hundredths of a second. The introduction of wireless telegraphy demands a re-examination of all these questions, while at the same time it lends powerful aid in their elucidation; for they all enter into the results of any one observatory in a semi-systematic way, and are shown up in striking fashion when it is a question of determining time and longitude in the way which is contemplated for the *Service internationale de l'heure.*

We have already remarked that there has been some delay in establishing this service. The official report of the Conference that met at Paris in October has not yet been published, and nothing is known publicly of the reasons for the delay in putting into operation at any rate the new partition of hours and the new scheme of signals. It is, however, worth while to note that the complete realization of the scheme must necessarily be delayed for some time. The essence of the plan is that the time to be distributed from the central bureau shall be international: that is to say, it shall not depend upon the observations of a single observatory, but upon the mean of all those co-operating, taken with due regard to the weight of each contribution in respect especially of its age or the time which has elapsed since the star transits on which it is based were made. Now it is obvious that before such a co-operation can be effective in producing a highly accurate absolute determination of Greenwich time, it is essential that the relative longitudes shall be known with a high degree of precision, a precision much greater than has been achieved up to the present time.

Were the contributions of all the observatories uniform in their incidence, these errors of relative longitude would not matter very much. The mean of all the contributed times would be, not the time of the meridian of Greenwich, but of a fictitious meridian very near that of Greenwich. But since in practice the contributions of each would vary in their incidence with the varying weather at each observatory, the fictitious meridian would oscillate sympathetically, and the desired accuracy would not be achieved. In practice these roughnesses would show themselves in the residual differences between the times communicated by each observatory, and they would gradually be smoothed out by adjustments of the adopted longitudes. But at first they would be conspicuous. During the first year or two of an international co-operation such as will be established, the principal outcome would be in effect the re-determination of all the longitudes in Europe.

Since it is agreed that the basis of the longitudes shall be the meridian of Greenwich, a special responsibility rests upon that Observatory, and it will be of great interest to see what view is taken of the adequacy of the Greenwich instrumental equipment for the duty which will be thrown upon it. The famous

meridian circle built by Airy some sixty years ago is unique, in that it has, without any serious modification, been at work ever since at full pressure, and has probably achieved as much as any other dozen instruments. But this has necessarily required that Greenwich should be content with a slightly lower degree of meticulous refinement than is the rule of some other observatories, where the elaboration of method and instrument is much greater and the output of work correspondingly less. British astronomers all over the world will await with a lively interest the outcome of the new conditions, and public opinion will demand that whatever new provision of instruments or of space may be required shall be granted by the country in a spirit fully conscious of the great position which Greenwich occupies.

While the schemes for the establishment of international time, and a re-determination of longitudes already fairly well determined, must necessarily make slow progress, there has been no delay in getting to work with the utilization of time signals by wireless in the survey of a new country. In the last Year-book we wrote that "territories which are unmapped now, and which are likely to remain unmapped indefinitely under the old régime, might at relatively small cost be covered with astronomically determined positions . . . which would serve as centres of survey for the surrounding country." Every month brings news that such surveys are being conducted with great activity. French parties in the Sahara desert, Belgian parties in the Congo forests, Dr. Filippi's expedition in the Himalayas, Commander Edwards on the survey of the disputed frontier between Bolivia and Brazil, have all used wireless for the determinations of longitudes, and all agree that its introduction has revolutionized the methods of exploratory survey. The last case is of especial interest, because the survey parties were at work before wireless signals became available and they have been able to improvise their equipment while their work was under way. The Brazilian station of Porto Velhò was within easy range, and by leaving a small party there to determine the time and signal it each night they were able to carry out a whole series of longitude determinations which served all their requirements, though their receiving aerial was nothing more than a long wire hung up in the tallest trees.

Let it be understood that the old objection to the use of astronomical positions in map-making is not in the least affected by the revolution in methods which makes the determination of these position in both co-ordinates, longitude as well as latitude, so relatively easy. Astronomical positions will never be sufficient for precise mapping, because of the irregularities in the direction of gravity at places relatively near together. An astronomical position is the direction of the vertical at the place, referred to the polar axis of the Earth, and the plane of the prime meridian. But owing to local attractions and deviations of gravity the vertical of a place is rarely quite perpendicular to the spheroid which represents as best it can the general figure of the Earth. The consequence of this is that the difference of two places in latitude and longitude, as determined astronomically, will rarely correspond precisely with the distance between them as actually measured on the ground. Hence for precise mapping, on a large scale, the old process of triangulation will never be superseded by latitudes and wireless longitudes.

But there are immense regions of desert and forest in which triangulation is so expensive as to be impracticable, and in which very precise work is happily not required. It will be long before the forest of the Aruwimi is closely settled and wanting a precise cadastral or topographical survey on a large scale. But meanwhile it urgently wants a map of some kind, which shall be accurate enough to show no perceptible errors on the scale of one in a million—for example, the scale of the new International map of the world. This the introduction of wireless can achieve, and is in fact already achieving so quickly that it seems likely the surveys will far outrun the capacities of the cartographical establishments to produce the sheets.

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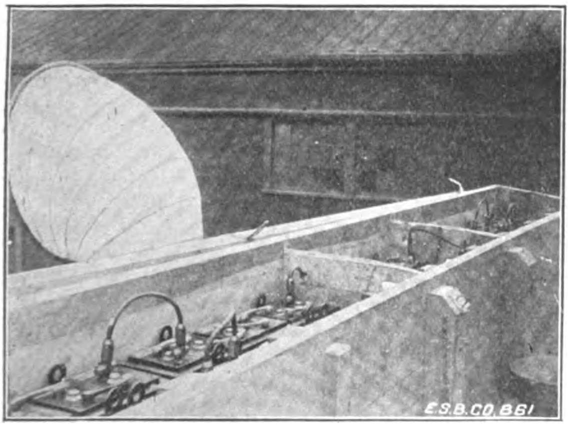

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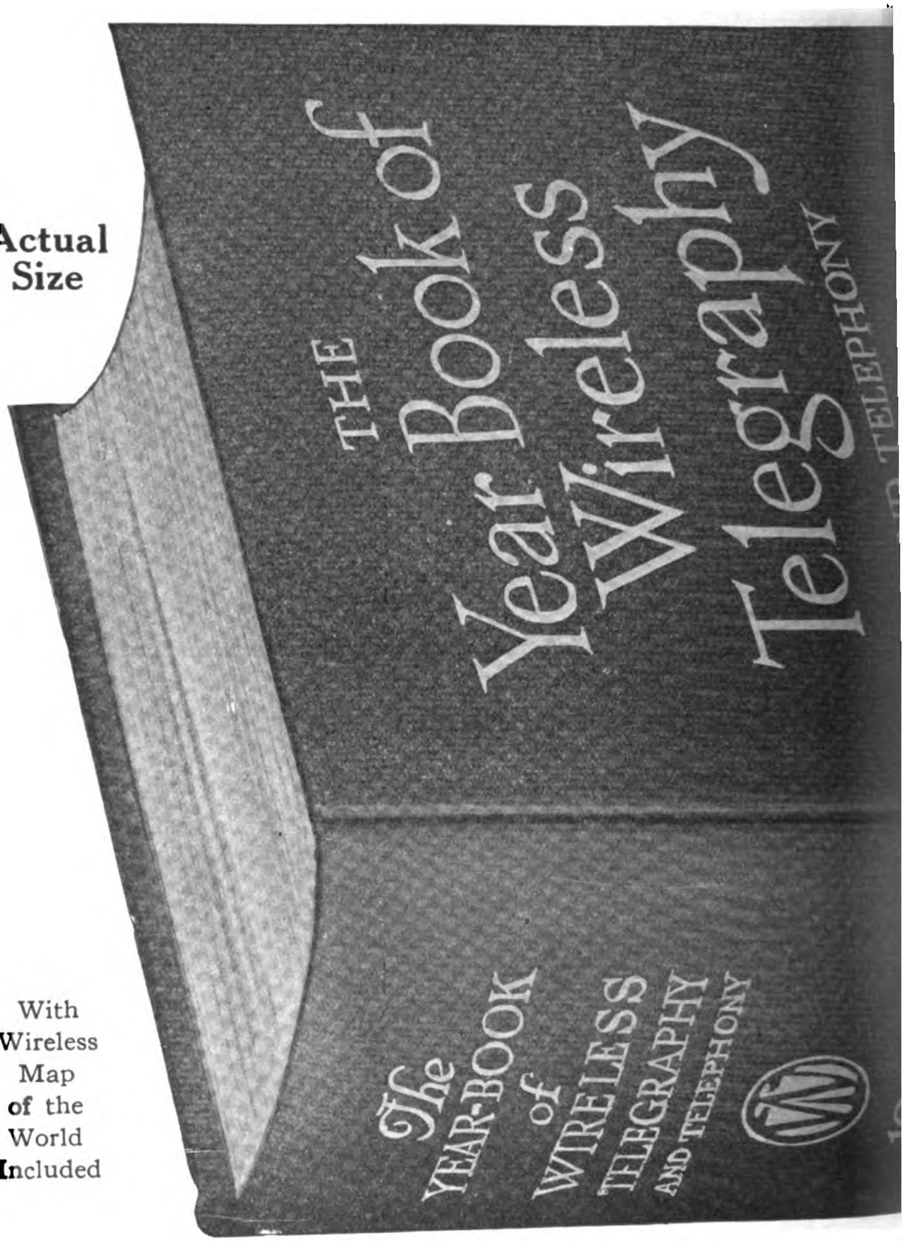

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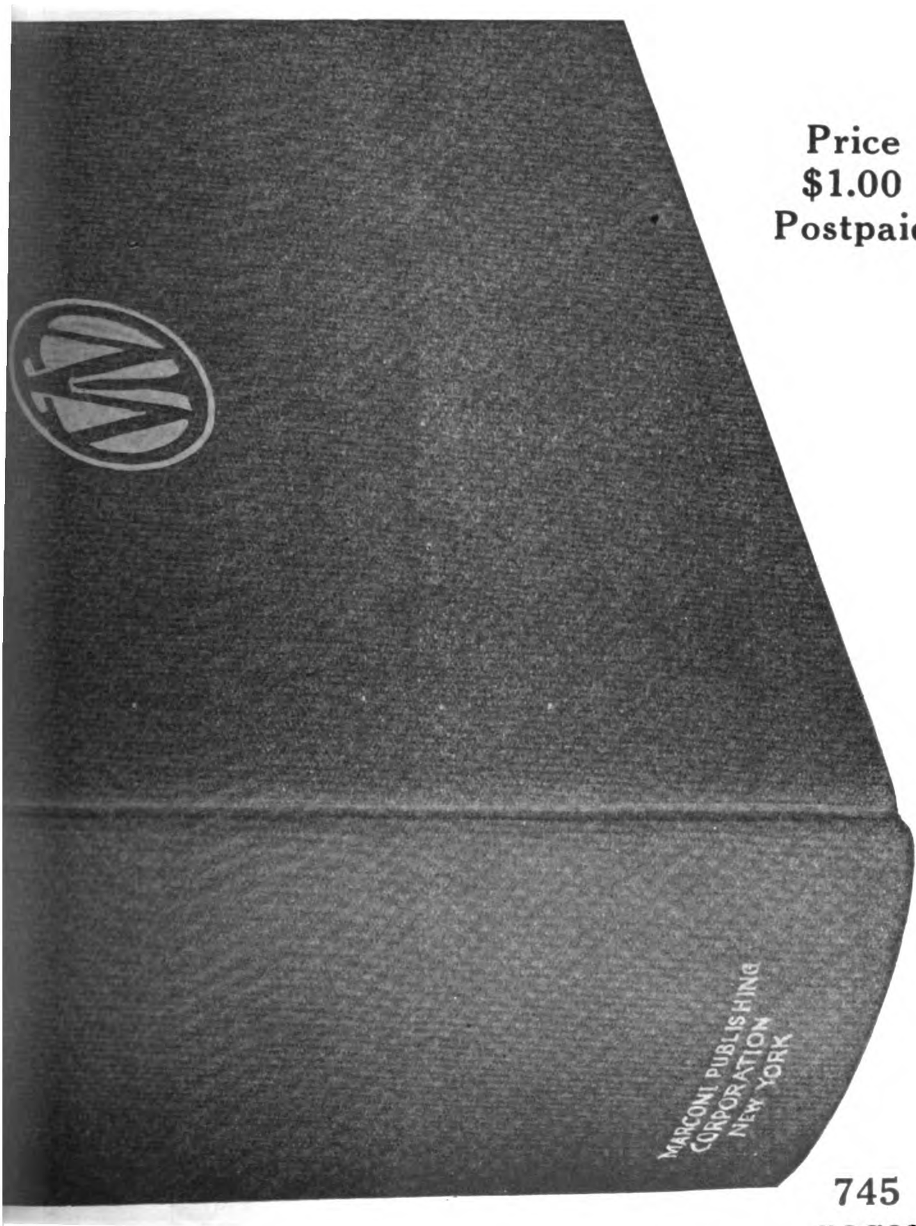

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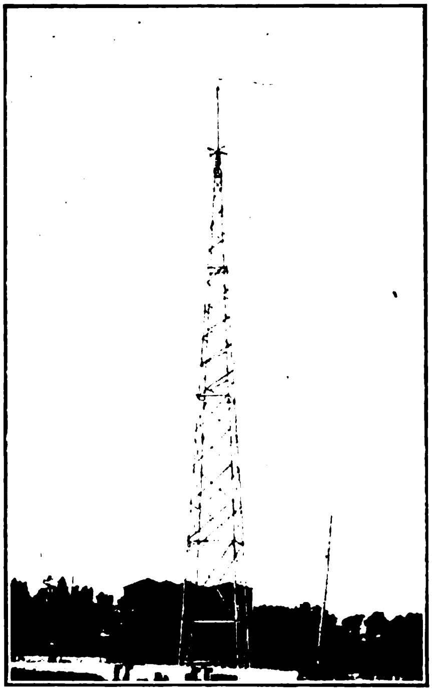

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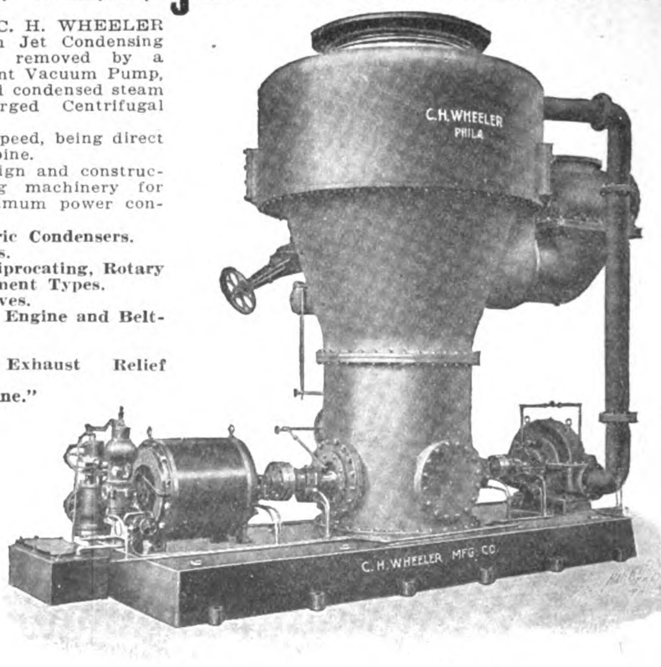

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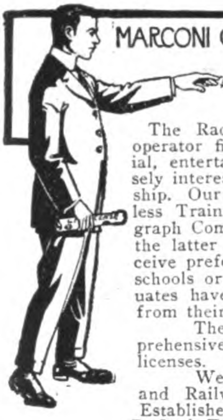


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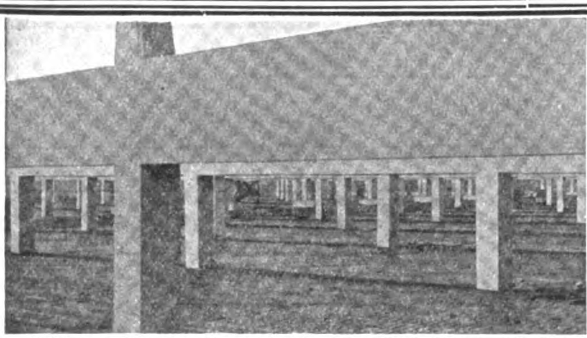

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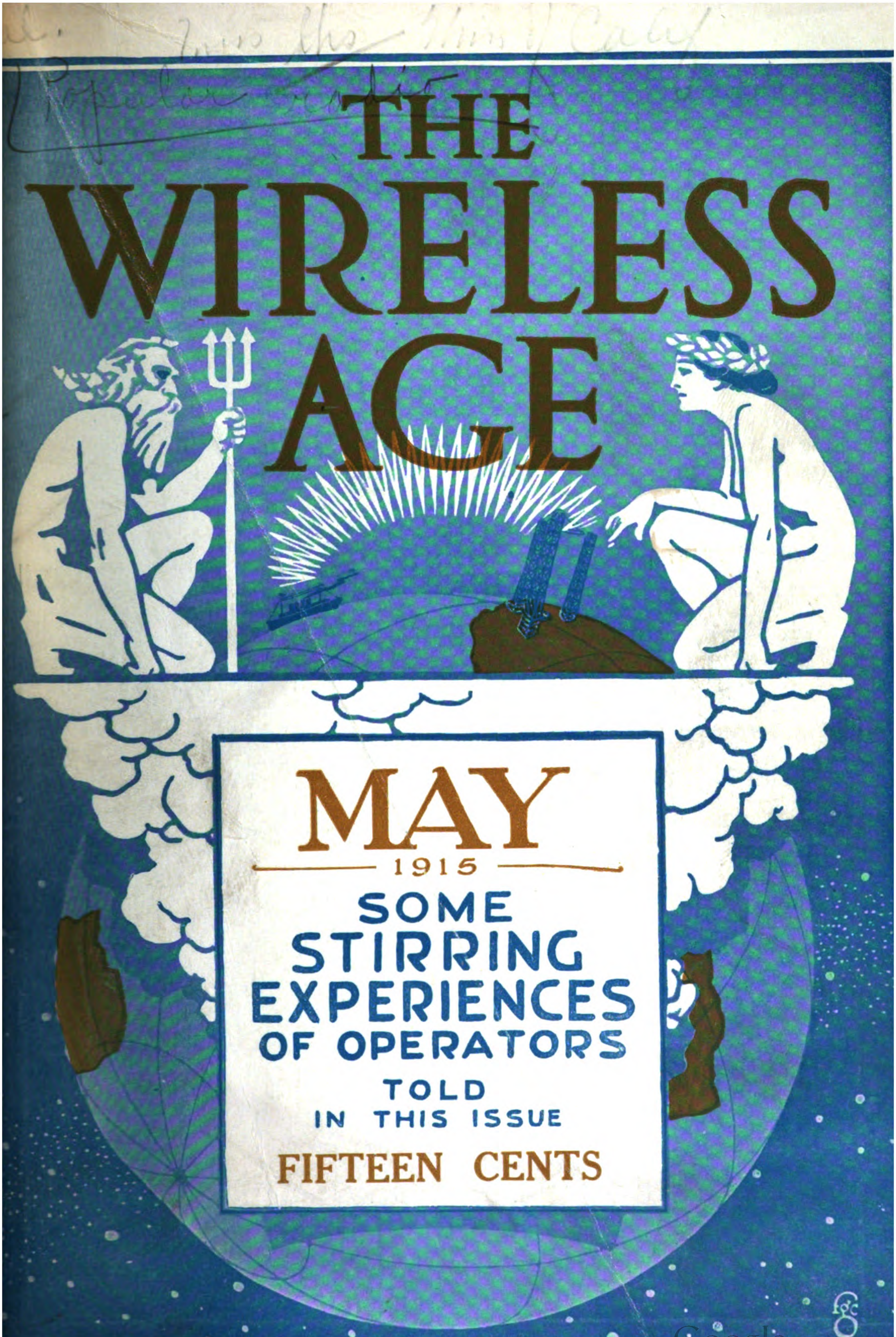
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TEXT BOOK ON WIRELESS TELEGRAPHY, pp. 352. Stanley, R. A text book covering the elements of electricity and magnetism, with details of the very latest practice in wireless telegraphy in European countries—recommended to all workers in the art of radio telegraphy	2.25	**3.25**
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An Illustrated Monthly Magazine of RADIO COMMUNICATION

Incorporating the Marconigraph

J. ANDREW WHITE, Editor — WHEELER N. SOPER, Asst. Editor

Volume 2 (New Series) — **May, 1915** — **No. 8**

CONTENTS

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THE WIRELESS AGE

Statement of the ownership, management, circulation, etc., of THE WIRELESS AGE, *published at New York, N. Y., required by the Act of August* 24, 1912. *Editor, J. Andrew White,* 233 *Broadway, New York; Managing Editor, J. Andrew White,* 233 *Broadway, New York; Business Manager, John Curtiss,* 450 *Fourth Avenue, New York; Publisher, Marconi Publishing Corporation,* 450 *Fourth Avenue, New York. Owners: Marconi Publishing Corporation,* 450 *Fourth Avenue, New York.*

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Sworn to and subscribed before me this 19*th day of March,* 1915.

C. J. OLIPHANT,
Certificate filed in New York County, No. 17,
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MAY, 1915

Annual Meeting of the American Marconi Company

At the annual meeting of the Marconi Wireless Telegraph Company of America, held on April 19 at its offices, Nos. 243 and 245 Washington street, Jersey City, N. J., the yearly report of the directors was presented, a summary of the company's business being given. The following were re-elected directors of the company to serve for a term of five years: Edward L. Young, John Bottomley and George S. De Sousa. At the adjourned meeting of the directors held on April 20 the following officers were elected to serve until April, 1916, or until their successors be elected: President, Hon. John W. Griggs; first vice-president, Guglielmo Marconi; second vice-president and general manager, Edward J. Nally; third vice-president, secretary and treasurer, John Bottomley; assistant treasurers, George S. De Sousa and Reuben S. Harlan. Hon. John W. Griggs, Guglielmo Marconi, Edward J. Nally, James W. Pyke, James R. Sheffield, and John Bottomley were re-elected members of the Executive Committee for the ensuing year.

The Report of the Directors

The report of the directors follows:

To the Stockholders:

The Directors of the Marconi Wireless Telegraph Company of America hereby submit Balance Sheet and Profit and Loss Account for the year ended December 31, 1914, as prepared by Messrs. Arthur Young & Company, Accountants and Auditors.

The acquisition in 1913 of the tangible assets of the United Wireless Telegraph Company by your company, placed under its control all of the coast stations of importance on both the Atlantic and Pacific coasts, besides which practically the whole of the American mercantile marine is at present fitted with wireless apparatus.

The number of ship and shore equipments now operated by your company is approximately twenty times that of three years ago.

This growth has made imperative a proper organization to operate the company as a public utility of nation-wide importance, and the development of a competent organization and working staff to conduct the business economically and efficiently has been one of the most noteworthy achievements of the twelve months past.

Through exhaustive study of present requirements and future needs many vital readjustments in administration policies have been effected; a searching investigation has been made to determine manufacturing costs and the operations of the company have been placed on a basis which is fair and equable to patrons but allows your company a greater margin of profit.

For the first time since the organization of the company the field of wireless communication has been cleared for proper development. Building up the company to its present strength and importance, which would ordinarily have been a hard enough task, has been made doubly difficult by meeting with competition of companies having no regard for your company's vested patent rights.

The accomplishments of this year, however, reflect the wisdom of the early established and steadily maintained pol-

icy of your company: To remain a progressive public serving utility, directing every energy to bring the wireless art to its highest possible perfection, conducting its business on a fair margin of profit, and at all times giving its clients the best service possible. In conformity with public demand your company's service has been steadily extended and its apparatus developed to a standard recognized by the Government, the steamship owners, railroads and large industrial companies.

Report on Manufacturing

The factory purchased and equipped at Aldene, N. J., has been found admirably suited to your company's purposes. Exceptional shipping facilities, convenience to the New York headquarters, a floor area of 20,000 square feet and ideal hygienic conditions have all added their quota of productiveness to the operation of an equipment comprising nearly 100 types and styles of manufacturing machinery.

Aside from supplying apparatus for new installation contracts, the factory is steadily engaged in producing improved equipments, with the object of gradually replacing all apparatus now in service which (as the Interstate Commerce Commission defines it) is out of date "through obsolescence or inadequacy resulting from age, physical change, or supersession by reason of new inventions and discoveries." In this way clients will have better apparatus as individuals and better service as a system, each unit being benefited with each step in the gradual substitution of advanced apparatus.

Report of Rental Increase

To secure a return commensurate with investment and cost of operation it was found necessary to raise the rental figure of the ship equipment contracts which were acquired with the purchase of the assets of the United Wireless Telegraph Company. These contracts had been made at so low a figure that carrying them to the expiration of their full terms entailed a substantial loss to your company. As fast as these contracts expired your company has endeavored to make new ones on a more equable basis and with provision for the increased cost of operation, due to the necessity of maintaining the great number of shore stations required to give the steamships the service they need and the public the full margin of safety under the regulations of the U. S. Radio Act.

But while your officers were convinced and made known the fact that the condition of the company's business justified asking the increased rates, organized opposition was encountered from steamship companies which had long enjoyed the lower figures. The natural opposition to the added expense was encouraged by manufacturers who offered to steamship owners various types of apparatus for outright purchase, pointing to the advantages of the compulsory opening of shore stations to all ships under the Berlin Convention, through which their individual equipment was made operative with expensively installed and maintained Marconi system of shore stations.

In the face of combined opposition of this character your officers steadfastly adhered to the rental policy, and are pleased to report eventual success in convincing steamship owners of the justice of the rate increase, and as rapidly as the old contracts expire, they have been able to renew at the higher figure.

Under all new arrangements a standard contract has been prepared; no favors or privileges are given to one client in discrimination over any other.

Report on High Power Stations

In addition to the progress made in ship and shore communication, much has been accomplished during the year with the high power stations for long distance work. In the northern district on the Pacific Coast—probably the largest in point of territory in the Marconi organization—there has been completed a powerful station at Ketchikan, Alaska, and a chain of wireless stations to cover this territory has been planned.

Congress recently passed a bill authorizing the construction of an Alaskan railroad at a cost of $40,000,000.00, and with the new transportation facilities it is estimated that the rich production of this region will be enormously increased.

That wireless telegraphy will experience a corresponding rise in commercial importance is evidenced by the fact that for years the only telegraphic communication between the United States and Alaska has been by a Government-owned cable which operates but six hours a day.

At Juneau your company has another station under construction and the United States terminal at Astoria, Oregon, is nearing completion. This latter plant will be ready about May 1, and the first link in the chain will then be opened to public service.

Your company's Trans-Pacific service between San Francisco and Honolulu was opened September 24, and with but few interruptions of short duration, due to the failure of the power company to supply current, has been working continuously ever since. The service rendered has been most satisfactory and almost without complaint from the public.

This service was inaugurated with a substantial reduction in the rates established and maintained by the cable company over a period of some eleven years' operation. As a result your company secured most of the business and, notwithstanding the fact that the cable company was compelled some months since to reduce their rates to meet ours, the volume of wireless traffic still shows a continued increase. Two new classes of messages, the Night Letter and the Week-end Letter, which were introduced into the wireless service, have become very popular with the Hawaiians.

The arrangements made for direct service between New York and London had been practically completed when the outbreak of the war forced your officers to set aside the vigorous campaign through which it had been planned to secure a share of the Trans-Atlantic cable business. The duplex stations at Belmar, N. J., and New Brunswick, N. J., were completed and being tested late in July when word came that the corresponding English stations at Carnarvon and Towyn, in Wales, had been commandeered by Great Britain for the use of the Admiralty. This came as a very serious blow to your company's hopes. A strong Trans-oceanic Department had been organized and twenty-four hour service was to be provided through a new commercial office opened in the heart of New York's financial district.

There is small likelihood that your company shall be able to continue tests or open the stations to public service until the end of the war, but when that time arrives your officers expect to be reimbursed in full, claims for indemnity on losses sustained being included with those which the affiliated English Marconi Company will ask from the British Government.

The direct service between Boston and Norway through the trans-oceanic stations which have been building at Marion, Mass., and Chatham, Mass., has also been blocked by the war. The construction work on both the stations of your company and those in Norway is almost finished and the installation of the apparatus could have been completed before now had it not been that the equipment is being made in England. It is doubtful whether it can be delivered here or in Norway until the war is over.

Norway, though popularly conceived as a country of little commercial importance, in reality ranks fourth in tonnage among all the maritime powers of the world, and the connection with Boston, one of America's greatest seaports, should prove a profitable one when the circuit can be opened.

Development of New Fields

The application of wireless to railroading has made some advances following the graphic demonstration of its utility during the blizzard which swept the Eastern States early in last year. All the railroads in the zone affected were blocked for hours, and in some cases, days, the one exception being the Lackawanna Railroad, which had installed a Marconi system, and through it operated its trains wholly by wireless and without mishap. Two other railroads called upon the Lackawanna to forward messages and were greatly aided during the time when their wire telegraph lines were prostrated. Wireless telegraphy as an auxiliary means of communication is now receiving the close consideration of railroad organizations and from all appearances this branch of your company's

business is soon to be considerably expanded.

Report of the Legal Department

The long series of court proceedings growing out of the exploitation of Marconi's wireless telegraphy, which has tried your officers' patience through many years, has finally been crowned with several splendid decisions rendered in your company's favor.

In a suit entered against the National Electric Signaling Company, Justice Veeder of the U. S. Court on March 17, 1914, decided that Marconi was beyond doubt the inventor of wireless telegraphy and the patents he secured in 1897, 1898 and 1904 were valid. The opinion emphatically stated, "the evidence establishes Marconi's claim that he was the first to discover and use any practical means for effective telegraphic transmission and intelligent reception" of wireless signals.

Following this decision, suit was brought against the Atlantic Communication Company which uses the Telefunken apparatus of Germany. The court granted a restraining order, excepting, however, U. S. Government apparatus and the Government-owned Panama Steamship line equipments; later your company's opponent was enjoined and gave a bond of $14,000.00 to cover apparatus already installed.

Motion for an injunction against Fritz Lowenstein, who has been supplying infringing apparatus to the Government, was opposed by the Navy Department and was denied as regards equipment furnished to the Government.

Testimony is now being taken in two suits pending in San Francisco involving the Federal Telegraph Company and its Poulsen system.

The suit instituted in the Southern District of New York against the DeForest Radio Telegraph & Telephone Company and the Standard Oil Company, resulted in a preliminary injunction from Judge Hough, who voiced decided disapproval of the transaction in these words: *"I am convinced that down to the present time the expense of operation (and of litigation) has been so enormous that complainant* (Marconi Company) *has received no fair return from the invention which under decisions now ruling, I must hold to be of the greatest value and worthy of praise and reward."* Subsequent motions to vary or modify the order were denied and the Standard Oil Company reinstated Marconi apparatus on its ships at the raised rental figure.

Suit for infringement has also been brought against DeForest on the Fleming valve patent, of great importance because of superior effectiveness as a receiver of wireless signals. A counter action claiming infringement of several DeForest patents on modifications of the Fleming valve has been filed in New Jersey.

The Fessenden patents, owned and controlled by the National Electric Signaling Company, were sustained in a suit brought against the Telefunken interests and your company has since entered into a license agreement with the National Company which enables it to use what is known as "high frequency" apparatus, and have in turn granted the privilege of using the two well sustained tuning patents of Marconi and Lodge. Under this agreement your company secures the use of 171 patents owned by the National Company. The agreement further provides for an exchange royalty on all equipment sold or rented, and disposes of all pending appeals and active litigation with the National Company, leaving your company in a very strong position in event of any action arising through its use of "high frequency" apparatus.

Report of the Engineering Department

As a permanent organization your company must look upon service as the big influence in the continued patronage of the public. The policy of gradually replacing old steamship equipments with new and better apparatus has been well begun with the installation of more than two hundred sets during the year ended. It has not been your officers' aim to effect an instantaneous nor a general substitution of the latest production of the engineers, but to work toward the replacement of equipment which would soon become obsolete or inefficient, appreciating that with each change the entire Marconi system would be benefited.

APPARATUS STANDARDIZED

It has been determined that with the recent development in the art the adoption of standardized apparatus is now practicable, and foremost in the record of the year's progress is the design of a commercial set in which the various parts of the apparatus are mounted on a single switchboard panel. With this improved equipment an installation can be made in one-quarter of the time formerly required and with a proportionate saving in labor and expense. Under the old conditions the installing engineer located the various apparatus comprising the set according to his best judgment, uniformity of installation being impossible owing to the varied construction of ship cabins.

ADJUSTMENT SIMPLIFIED

The new standardized equipment has the further advantage of complete assembly and testing at the factory and later shipment intact. In its construction special provision has been made for quick and convenient means of varying the transmitted wave length to prevent interference from other stations, and the tuning apparatus has been considerably simplified.

AUXILIARY PANEL SET DESIGNED

With the growing demand for more powerful emergency transmitting equipment a similar but smaller panel set has been produced and placed in service. It occupies minimum space and is capable of operation with the current furnished by the vessel's main or auxiliary power supply.

GOVERNMENT CONTRACTS SECURED

A variety of experimental fields have been explored and a quantity of research work covered, to the end that some revolutionary changes have been made in apparatus construction. The United States Government has purchased considerable apparatus for the Navy, and your company has supplied all the new equipment for the Army and the Revenue Cutter Service. A line of high frequency measuring apparatus has been developed and outside sources no longer need be depended upon for these important instruments.

WIRELESS TELEPHONE DEVELOPED

It is also practically assured that during the coming year a commercial wireless telephone will be placed on the market.

Revenue from Message Traffic

While in the year ended there has been created a new source of revenue from Trans-Pacific stations, the message traffic between shore and ship has been greatly affected by the war. The revenue from ships flying the American flag has been considerably increased, but the gain thus made has not been sufficient to offset losses due to the withdrawal of so many foreign ships from American waters.

Beginning with November, the curtailment of the revenue from long distance press service and ship traffic show distinct losses over previous years, yet prior to that time and notwithstanding the war, your company's message traffic between shore and ship every month showed a handsome increase over previous years. That this increase would have been greater but for the war goes without saying, but the fact nevertheless remains that revenue from message traffic has been seriously affected by the paralyzing effect of the European hostilities on maritime commerce.

Casualties and Rescues

As in past years, new instances of the humanitarian values of wireless telegraphy are again emblazoned on your company's imperishable record of service to mankind. Although long recognized as an indispensable aid to navigation and an invaluable means for saving life, a greater and more significant fact, borne out again as in years past, is that Marconi wireless has never failed. The apparatus has ever been reliable, the men dependable.

Every important marine rescue of the year was effected with Marconi apparatus, manned by Marconi men. In the courts, laboratories and newspapers, other wireless men and "systems" are occasionally heard from, but when something is done, when wireless is needed urgently, it is always Marconi men and apparatus which respond to the appeal for succor in emergency. While it is true that this effectiveness is in a great measure due to your company's appa-

ratus being installed on practically every vessel of the American merchant marine, it is nevertheless gratifying beyond expression that in the many cases where it has been put to the test there have been no failures. Into the service there has grown what has come to be known as the Marconi Tradition—that Marconi never fails.

Appreciation of wireless operators' devotion to duty has been recorded in the public press reports of many great ocean tragedies, but a record your officers are equally proud of, and take this opportunity to recognize, lies with the many silent heroes who continually rise to emergencies and are overlooked because the mishap has a successful outcome.

The year has carried with it a number of unfortunate marine disasters and many indications of the highest courage and devotion to duty among operators. Standing out clear and sharp is the noble self-sacrifice of Ferdinand Kuehn, who, after flashing a successful appeal for aid, when on January 30th, the passenger laden Monroe sank in fog-bound waters, gave his life preserver to a woman passenger and with it gave also his life.

Worthy of equal commendation is the manner in which Loren A. Lovejoy proved himself the man for an emergency when on the steam schooner Hanalei, pounded on a reef until her wireless cabin was washed away, he signaled code instructions by a pocket flash light lamp to the lifesavers on the beach, and thus directed the work of rescue. Operator Lovejoy was saved and remains in your company's service; his assistant Adolph J. Svenson, who rendered invaluable and heroic assistance, was drowned when the ship broke up and the passengers were being transported to safety.

A memorial fountain to the wireless operators lost at sea has now been completed and stands in Battery Park, New York. The majority of the contributions toward its erection have been subscribed by Marconi operators.

Expenditures and Reserves

In a period of abnormal conditions your company has made steady progress in development of necessary organization and provision for future betterment and growth when the plans for expansion shall be made operative with the close of the war.

Meanwhile, all expenditures for new construction have been reduced by postponing such work as was not immediately necessary, economies have been effected in all stations where it has been possible to reduce the staff and hours of operation, and expenditures of all kinds are given the most careful scrutiny before being authorized.

Your directors have decided on a policy of depreciation and depreciation reserve and have set aside from the operating revenues substantial amounts for the purpose of creating and maintaining proper and adequate depreciation reserve; first, to cover those losses defined by the Interstate Commerce Commission as "suffered through current lessening in value of tangible property and wear and tear not covered by current repairs"; second, to meet depreciation of patents and patent rights.

For the Directors,

JOHN W. GRIGGS, *President.*

The balance sheet of the company will be found on pages 568-569.

THE SHARE MARKET

New York, April 22.

The influence of the speculative trading on the Stock Exchange has not extended to the outside market and the transactions of the day continue regular and equal to the expectations of the brokers. The sagging tendency following spectacular rises in listed industrials is not reflected in curb issues and Marconis remain steady and mildly active. The English shares retain the slight advance reported last month. Canadians are stationary and American Marconis show a fractional advance over the previous quotations.

Bid and asked prices to-day:

American, 2⅝-2⅞; English, common, 9-12½; English, preferrred, 8-11½; Canadian, 1⅛-1½.

MARCONI IN NEW YORK

Guglielmo Marconi arrived in New York on the steamship Lusitania on April 24.

MARCONI WIRELESS TEL

BALANCE SHEET

ASSETS

Current Assets:			
Cash:			
At Banks and on Hand	$88,436.26		
At Banks on Deposit	560,000.00		
Call Loans with Bankers	190,000.00		
		$838,436.26	
Accounts Receivable		393,334.70	
Investments at Cost (Market Value, March 20, 1915, $1,402,947.50):			
Railroad Bonds and Notes	$1,101,427.75		
Municipal Bonds and Notes	300,000.00		
		1,401,427.75	
Work in Progress, Materials and Supplies.		351,637.84	
			$2,984,836.55
Stocks in Subsidiary Companies			18,970.00
Fixed Assets:			
Real Estate		$314,506.19	
Buildings, Coast Stations, Machinery and Equipment		4,013,875.75	
Ship Stations		294,735.06	
			4,623,117.00
Deferred Charges			77,243.70
Patents, Patent Rights and Good-will			2,763,005.25
			$10,467,172.50

New York City, March 24, 1915.—We have examined the Accounts and Records of the the above Balance Sheet and accompanying Summary of Operations for the year 1914, 31, 1914, and its Operations for the year ended that date.

ENGLISH MARCONI DIVIDEND DEFERRED

Marconi's Wireless Telegraph Company, Ltd. (the English company) has announced that the directors decided to defer payment of the interim dividend on the ordinary shares owing to the abnormal circumstances prevailing. The usual 7 per cent. dividend is to be paid on the preference shares. The statement to shareholders states that the company has continued since the outbreak of the war in full control of its business, but its stations have been largely devoted to Government work. For this reason the new direct public service with New York, which it had been contemplated would have been opened in the summer of last year, has had to be postponed. In other respects

GRAPH COMPANY OF AMERICA

DECEMBER 31, 1914

LIABILITIES

CURRENT LIABILITIES:			
Accounts Payable			$404,228.48
CAPITAL STOCK:			
Authorized 2,000,000 Shares of $5 each		$10,000,000.00	
Less:			
119,486 Shares subscribed for not yet issued			
100 Shares in Treasury			
119,586		597,930.00	
1,880,414			9,402,070.00
RESERVES:			
For Depreciation of Coast Stations:			
As at January 1, 1914	$138,387.37		
Add:			
Amount set aside from 1914 Profits	30,037.74		
		$168,425.11	
For Depreciation of Ship Stations:			
As at January 1, 1914	$11,589.72		
Add:			
Amount set aside from 1914 Profits	29,473.50		
		41,063.22	
Against Expiration of Patents, amount set aside from 1914 Profits		50,000.00	
For Contingencies:			
As at January 1, 1914	$24,314.68		
Amount set aside from 1914 Profits	12,500.00		
		36,814.68	
			296,303.01
SURPLUS:			
Balance per Certified Accounts, January 1, 1914		$214,693.54	
Add: Net Income for year ended December 31, 1914 (after charging $122,011.24 Reserves)		149,877.47	
			364,571.01
			$10,467,172.50

Marconi Wireless Telegraph Company of America, and as a result thereof have prepared which in our opinion correctly set forth the financial position of the Company at December

ARTHUR YOUNG & Co.,
Accountants and Auditors.

the company's business has been necessarily disturbed, and considerable business which was pending in many foreign countries has been delayed or deferred. This, however, has been substantially compensated for by Government and other business directly resulting from the war. The works and all the company's staff have been working under the highest pressure throughout the whole period.

A number of matters, including the question of compensation and payment for services, being still in abeyance, the directors are as yet unable to estimate with sufficient reliability the results of the business of last year to warrant them at this moment in declaring an interim dividend upon the ordinary shares. They are, however, of opinion

that there is no reason for deferring the dividend upon the preference shares. The directors contemplated being in a position to give shareholders information with regard to other matters of importance concerning the company's business, but as these still remain under negotiation it has been resolved not to delay further this announcement and the payment of the dividend.

Coupons of the preference shares have been payable since April 19 at the Hanover National Bank, New York.

NEW STATION IN BRITISH HONDURAS

The American Consul at Belize, British Honduras, reports the new wireless telegraph station at that point was on February 6 declared ready to receive commercial messages for transmission, subject "to censorship both at Belize and at their destination"; no code or cipher telegrams being accepted for the present.

The tariff now in effect has been fixed at "ten cents per word, to which must be added the charges of other systems" which works out at 35 cents a word from New York or Washington to British Honduras.

The two towers are each 250 feet in height, the equipment in use having a range of action of approximately 600 miles.

The wave length, as given by the chief operator, is "600 meters commercial, 1,000 meters special with Swan Island."

The station is the property of the Government of British Honduras. This public utility, now completed, gives this colony two telegraphic systems—the overland line, Belize to Consejo, British Honduras, then by cable (3 miles) Consejo to Payo Obispo, in the Territory of Quintana Roo, Mexico; overland from Payo Obispo to Puerto Mexico, Yucatan; and again by cable from Puerto Mexico to Galveston, Texas.

So many miles of the overland line passes through a dense jungle, with frequent interruptions by wind storms and falling trees, that the service has proved very irregular.

WIRELESS COMPASS GREAT AID

Crossing the Atlantic in war time with cabins filled sharpened the appreciation of Captain S. C. Hiortdahl, commander of the Kristianiafjord, of the Norwegian-American Line, for every aid to safety at sea as it has intensified the interest of every other careful master of passenger carrying vessels. He was so struck with the possibilities of one of the latest additions of science as a protector of ships and human life that he spent nearly all his time ashore between voyages last winter in experiments on his own account.

He made investigations in this country as he had done in Norway of the wireless compass or direction finder, perfected not long ago under Marconi-Bellini-Tossi discoveries, and in a recent New York newspaper interview expressed warm admiration not only for what service he had found in its use, but also for the safety at sea possibilities he saw in its development. In Norway and off its coast, he said, he had made extensive experiments with the wireless compass in connection with naval vessels of his country, and had obtained gratifying results. Captain Hiortdahl said he had been enabled to ascertain from the shore and from his own ship at sea the exact bearings of other vessels, as verified by their own observations, the results proving accurate and available up to a distance of 120 miles.

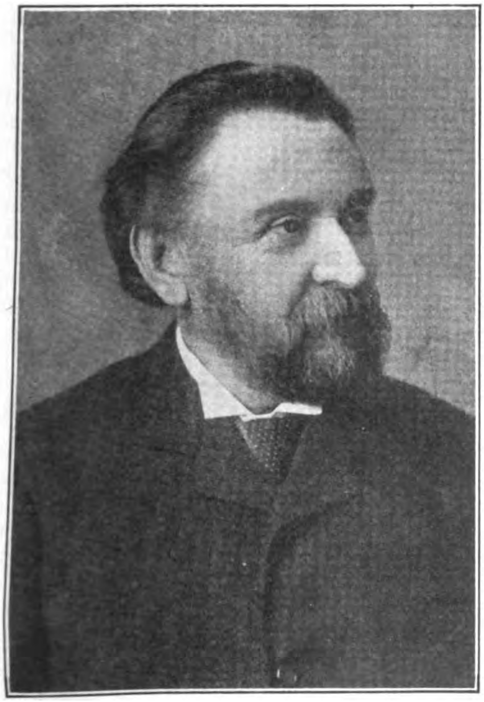
"If this instrument is installed on shore stations, which some of the officials in the Norwegian government telegraphic service propose," said Captain Hiortdahl, "it will be possible to send the exact bearings of any ship from that station to another ship. In case of fog or hazy weather this is of incalculable importance. Imagine the valuable service which could be rendered if such reports could be received and sent from Nantucket, Siasconsett and other points on the coast line at a fixed charge to the ship for supplying its correct bearings and allowing the captain to verify his own calculations. We are experimenting with the device at Nantucket and Siasconsett."

OBITUARY

Major S. Flood-Page

Director in American Marconi Company
Former Managing Director English Marconi Company

WORD was received in New York from London on April 8 that Major S. Flood-Page, a director in the English and American Marconi companies was dead. He was a son of the Rev. S. Flood-Page, who married a daughter of Colonel Shaw. The latter was active in military service, having been wounded at Quebec in 1759 while serving in the 60th Rifles. It was not a surprise, therefore, when Major Flood-Page, inspired perhaps by ancestral spirit, took up a military career. He became a cadet in 1854 and was gazetted a year later to the Second Madras European Light Infantry. He served in India and Burmah, becoming first adjutant of the Queen's Own Edinburgh Rifle Brigade and for twelve years acting as adjutant of the London Scottish.



Major S. Flood-Page

His excellent record brought him no little recognition, his services being solicited by military authorities for administrative purposes. Aside from his other achievements in military life he will be remembered because he was the first executive officer of the National Rifle Association. He served on the council board of that organization for forty years.

Major Flood-Page gained success in business life with the same rapidity that had marked his career in military circles. He was at one time secretary and manager of the Crystal Palace, retiring from that office in 1882. Then he became connected with the electric lighting industry which showed considerable activity about the time that he embarked in it. Joseph W. Swan, who was afterwards knighted, and others formed a company for the manufacture of the Swan glow-lamp, and to Major S. Flood-Page was delegated the task of introducing the invention into Australia. Major Flood-Page afterward became secretary and manager of the Edison and Swan United Electric Light Company, Limited.

He joined Marconi's Wireless Telegraph Company in 1899 as managing director, becoming a director of the American Company in 1906. For some twenty years he was a member of the London Chamber of Commerce and took a prominent part in forming the electrical section of the Chamber. During his life he was keenly interested in philanthropic and national movements as well as commercial matters.

Salvation at the Eleventh Hour

Henry McKiernan

The story of how, with hope of rescue gone, the men on the sea-battered Denver were preparing to risk their lives in the small boats, when aid was brought by the wireless appeal of Operators McKiernan and Crone

Fred H. Crone

Buffeted by the seas until she was in a sinking condition, the Denver of the Mallory Line, sent an S O S broadcast over the ocean when she was in mid-Atlantic, 1,300 miles from New York, on March 22. Despite the unfavorable weather conditions, aid was at hand in less than twenty-four hours after the appeal had been flashed and those on the distressed craft—seventy-two in all—were rescued. It was another triumph for wireless and the Marconi operators who sent and received the news of the Denver's plight, eighteen ships being ready to give assistance when the rescue was effected. The following story of the wreck and the circumstances of the voyage preceding it were written for THE WIRELESS AGE *by Henry McKiernan, first operator on the ill-starred craft, and Fred H. Crone, his assistant:*

IF the Denver had started her voyage on Friday the thirteenth, the superstitious among us might have anticipated the disaster which overtook the vessel. It was the thirteenth to be sure when we steamed away from Norfolk, Va., bound for Bremerhaven, Germany, but the day of the week was Saturday. The ship came to grief notwithstanding, the wreck and the incidents of the voyage preceding it being described in our story.

Fair weather and excellent progress marked the first week out of port. Afterward came a northerly gale during which the vessel listed alarmingly. We learned later that a safety plug in a boiler had blown out, making it necessary to empty the latter before repairs could be made, and that the removal of the water caused the list. One of the officers attempted to correct the careening of the vessel by ordering the lifeboats on the port side filled with water and in this he was in a measure successful.

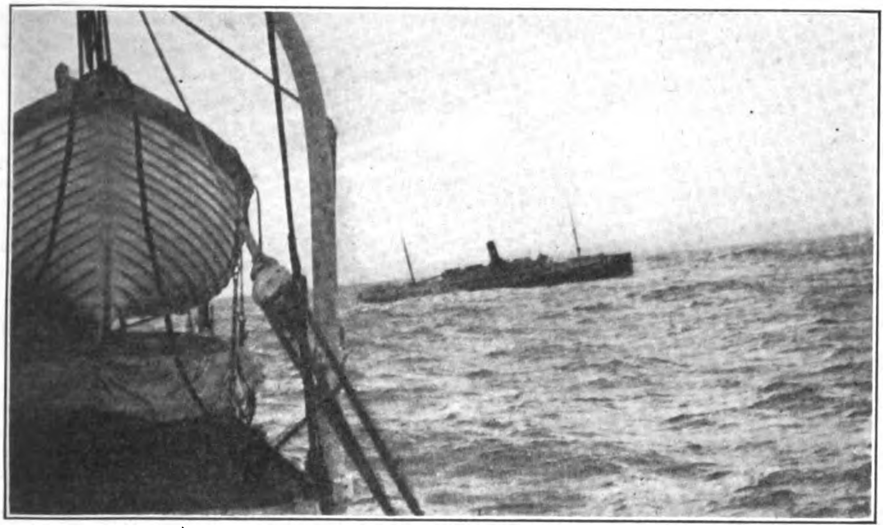
Grim warfare unexpectedly bobbed up astern of us on February 28. On the evening of that day we passed a steamship bound westward. Her actions were strange to say the least, for after she had steamed by she turned about and began to follow us. The boom of her guns and the flashes from their muzzles illuminating the night made us aware that she was not voyaging without a purpose. We did not realize, however, that she took more than a passing interest in the Denver until she was asked by wireless if she wanted us to stop. "Yes, at once," came the reply. It is needless to

say that our captain paid instant heed to the request and a short time afterward a squad of British marines came aboard the Denver, two being detailed to stand outside the wireless cabin with instructions to see that we did not operate the set. We were informed the following day that the British vessel had used only blanks when she fired her guns. When we arrived at Kirkwall we were ordered to take down our aerial and seal the doors of the wireless room. The marines left us at Kirkwall and we departed for Bremerhaven.

As we steamed through the North Sea the fear of the mines was uppermost in the minds of the majority of those on the Denver. However, we managed to reach Lister Deep in safety where we picked up a pilot. We were boarded later by German customs officers who lined up the members of the crew and questioned them. Among the Denver's men was a German who, when he saw the customs officers, gave himself up, declaring that he had returned to his native land to enlist. He caused some excitement among us, however, by pointing out our watchman as a Russian spy. The latter declared that he was a Swede, but the customs men arrested him and took him off the vessel, despite his protests.

Steaming on toward the mouth of the Weser River, we passed the German fleet off Helgoland, the long line of formidable looking war machines extending as far as we could see. That evening we were compelled to anchor and blanket all of our lights. German marines came over the side the next morning and we proceeded on our way to Bremerhaven, reaching there at three o'clock in the afternoon.

We remained a week at Bremerhaven, departing from that city on March 10. On the afternoon of the second day out of port we were stopped by a British vessel which signaled with flags, asking us our destination. The following night another British vessel communicated with us by means of flash-light signals. Again someone else asked us by wireless regarding our position. Thus we steamed on through the war zone.



This photograph shows the Denver after the rescue ships had reached her. It was taken by Operator William V. Moore from the deck of the St. Louis

The Denver ran into a heavy gale early in the morning of March 22, the wind blowing at the rate of ninety miles an hour. It kept increasing in force as the day advanced and we knew that the vessel was standing up under the storm with very bad grace. She was leaking, too, and her steering gear had gone out of commission, making it impossible to bring her head up into the wind. This

left her in the trough of the sea, pounded and tossed about by the waters. It was a critical situation, to say the least.

In this extremity the second mate came to the wireless cabin to inform us that the captain wanted the S O S sent. He added that immediate assistance for the Denver was necessary.

We took turns in flashing the signals and an hour after the first appeal had been spread broadcast all of the vessels within our radius were aware of our position, the Denver being then in mid-oceans, about 1,300 miles from New York. The vessels which received our appeal transmitted it to other craft and soon a small fleet of rescue ships was on its way to succor us.

But we did not feel that our peril was at an end, for the gale continued unabated in its fury, lashing the seas into mountain-like waves and making difficult the navigation of the staunchest craft. Some of the vessels which received our call, were within twenty miles of us, we learned, but they could proceed at the rate of only two miles an hour. So we were compelled to content ourselves with waiting and hoping.

In the meantime we prepared for the worst, making the boats ready for launching and placing a store of provisions in the wireless cabin to be used in an emergency. It is gratifying to be able to record that in those trying hours Mrs. Avery, the wife of our captain, remained outwardly unmoved by our danger, wearing a look of unconcern even as the seas seemed about to accomplish the destruction of the ship.

The following day found us still at the mercy of the gale and the waters. The latter poured into the ship in considerable quantities, the dynamo on which we were dependent for the power for our main set finally being placed out of commission. There still remained the auxiliary set, however, and this we worked to great advantage, the apparatus operating in a highly satisfactory manner.

By this time almost everyone had abandoned hope, although the members of the ship's company fought stubbornly to the very last to save the vessel. This was illustrated by the action of one of the officers who went into the hold to attempt to locate the leak. No one would follow him, but he stood in the water, which reached almost to his chin, until he had satisfied himself that the attempt was useless. Then he came on deck and offered $5 to the first man who sighted smoke.

While these efforts toward our salvation were being made we had been drifting at the rate of about five miles an hour. This, of course, made us sceptical regarding the chances of being picked up by the vessels which were searching for us, although we sent a message telling the direction in which we were floating. We reckoned that they might be scouring the waters for us many miles away and we steeled ourselves to meet any emergency that might arise. The understanding among the members of the ship's company was that they were to take to the boats before darkness arrived without waiting longer for the rescue ships. To embark on the troubled waters in small boats seemed like courting death, but with the Denver so battered and bruised that she was ready to drown at any time this was the only course left.

And while we planned to make a last attempt to preserve our lives thus, all the time fearing that the curtain was about to rise on another awful tragedy of the sea, someone sighted a bit of smoke. It was only a speck at first, but soon it grew into a cloud. Then we knew that the searchers had found us—that the rescue ships were at hand.

After a while the Manhattan, the smoke of which had heralded our salvation, was seen off our starboard bow. The St. Louis, the Vestris and the Megantic appeared soon afterward. The Manhattan and the Megantic, bound for New York, having been chosen as the craft to which the Denver's people were to be transferred, the boats were launched and the work of taking us off the wreck began. Considerable difficulty was encountered in this because the seas were still running high. We of the wireless cabin were among those who were taken to the Megantic.

The S O S which we sent started eighteen ships searching for the Denver.

They included the Lakonia, the El Dia, the Manhattan, the Oscar II, the Carthaginian, the Colorado, the Gulflight, the Nile, the Maryland and the Rotterdam. They stood by until the rescue had been effected, but their aid was not needed.

Additional details of how the rescue of those on the Denver was effected are contained in the log book of Joseph A. Worrall, Marconi operator on the steamship Medina, bound from Rotterdam to New York. They are as follows:

March 22, 1:50 P. M.—Received information from the steamship Ardmore that the Denver is sinking. Informed captain, but we are 200 miles astern and tremendous seas are holding us back.

2:32 P. M.—Gave KED (the Denver) our position and our speed.

2:40 P. M.—(the Megantic) offers assistance to KED. It will take him sixteen hours to get there.

3:10 P. M.—Exchanged signals with the Denver.

3:15 P. M.—The Ardmore says that they can't reach the Denver for two days.

4:10 P. M.—KED (the Denver) is now in communication with KUA (the Gulflight).

6 P. M.—The Denver sends out, "The Captain says come as quickly as possible."

6:45 P. M.—KED (the Denver) reports the fires out and getting the lifeboats ready to launch. He is sending out S O S continually.

7:40 P. M.—KED says: "We have been drifting southeast since our 2 P. M. position. We are sending off rockets."

March 23, 2:30 A. M.—MCZ (the Megantic) working KED (the Denver), using emergency gear. KED's position is now 38.50 N., 48.50 W.

4:50 A. M.—The following ships are now on their way to the assistance of the Denver: KSL (the St. Louis), MCZ (the Megantic), PHP (the Vander Duijn), MBN (the Maryland), KKY (the El Dia), GKK (the Manhattan), and MJZ (the Vestris).

7:10 A. M.—KED sends position and says the Denver needs immediate assistance. Expects to leave the ship any minute.

1:23 P. M.—Have heard nothing from KED (the Denver) for four hours.

1:38 P. M.—KED calls CQ and says they see a ship off the starboard bow.

1:50 P. M.—GKK (the Manhattan) says they see the Denver.

2:15 P. M.—KSL (the St. Louis) says he can see KED now.

2:25 P. M.—KED (the Denver) says they are now lowering boats.

2:35 P. M.—After finding out that KSL (the St. Louis) was bound for Liverpool and GKK (the Manhattan) was bound for New York, the Denver's captain decided to take the latter.

3:25 P. M.—GKK (the Manhattan) says two more boats are needed. MZC (the Megantic) is alongside the Denver.

4:10 P. M.—GKK (the Manhattan) advises all ships that no more assistance is required.

Marconigram Tells of Rescue

A wireless message from the Marconi-equipped steamship Seminole of the Clyde Line to the United States Coast Guard offices in New York City, told of the rescue by that vessel of the crew of the schooner Robert Graham Dun. The men abandoned the craft after it had been wrecked by a gale on April 3. The schooner was off the Virginia Capes when the crew took to a small boat which was picked up by the Seminole.

Reprimanded for Swearing

The United States Department of Commerce has written to a wireless operator in a commercial station in Massachusetts warning him that unless he is careful of the language which he uses his license would be revoked. He recently ended a message with a word which shocked those who heard it and complaint was made to the Washington officials. Code letters were used by the operator to spell the word that gave offense.

CHATEAU VEAUGIRARD

by Warren H. Miller

PERCHED high on the rocky escarpments which line the east bank of the Aisne, the Chateau Veaugirard dominated the whole valley for miles up and down its length. To tourists and to peasant folk alike its red French tile roof, its soft creamy stucco walls and its huge south chimney, built from the granite quarries of the Aisne, had long been a picture that the eye rested on admiringly from many a road turn, many a wooded promontory in the river valley below.

Just now it was occupied by the Germans, by the younger officers of the staff of General Von Slausen, who sprawled perplexedly over a huge war map, which, in relief contours of one meter apart, was spread on a great plank table set up on saw bucks in the grand salon of the chateau.

All the Veaugirards had fled toward Paris at the first sweep of the German armies, their butler in striped vest and no coat, their maids staggering under huge half-packed portmanteaus, their poodle without his collar, La Comtesse with her jewels and her vanity box crammed into a needlework basket—all bundled into the family six-cylinder automobile and speeded, along with the honking, squalling, blatting jam of thousands of other machines, down the road to Paris.

All but Mlle. Marie De Veaugirard. M. Le Comte was already with the government at Bordeaux; Jean, the younger brother, lay buried in the rose garden—killed in a brush with the Uhlans just down the road from the Chateau; Etienne, her older brother, lieutenant in the 107th of the Line, had, so the villagers whispered, disappeared. And so Marie stayed within the German lines, attended only by old Nannette and the house major-domo, Pierre; finding herself the hostess of a number of very gallant and scrupulously polite young German staff officers.

"I swear, I can't fathom it!" sighed young Captain Von Hasebrouk of the Magdeburg Fusileers, raising himself off the war map on his clenched knuckles. "From this point here"—indicating a promontory on the map—"down to the bend of the river, everything we do is known in the French lines, within apparently ten minutes from the time we set about doing it. If we place a new battery, their shells pick it out with uncanny accuracy; if we start an aviator anywhere near the chateau, a French airman is already on the wing and waiting for him; if our air scouts send us details by wireless concerning their dispositions, the wireless message is intercepted and the enemy's positions changed to some surprise manoeuver when our troops move. Even the War Office wireless messages from Nauen are relayed into the French lines."

"Mademoiselle De Veaugirard—she is being watched?" ventured Von Nurdenburg, the Bavarian engineer officer.

Von Hasebrouk regarded him with Prussian scorn. "Infantile! Of *course*

she is being watched—every moment of her life, since we took possession of the chateau! She is virtually a prisoner within its walls."

Von Nurdenburg's black Bavarian eyes snapped and the red Heidelburg scars on his cheek deepened. "Beast!" he muttered under his breath. Then aloud, "Only this," said he mildly, "those concrete gun bases up in the quarries, ordered in three weeks ago, are not in yet. We can't start a squad of men on them but a flock of shrapnel finds us out; and I tell you that those quarries are in plain sight of this building, from its rear windows."

"Another thing," put in Liebnitz, of the Saxon Hussars, "have you noticed that they never fire on this house? We use the roof for a wig-wag station, but nothing but rifle bullets come this way, scrupulously never a shrapnel shell."

"Humph!" grunted Von Hasebrouk testily, "Easily explained! They do not, my dear sir, take the same pleasure in making targets of a French chateau as we do. Enough with such foolishness!".

"Sorry I spoke!" retorted the Saxon stiffly as he saluted and went from the room.

"Herein!" snapped Von Hasebrouk a few minutes later in response to a knock on the door.

An orderly entered. "General Von Slausen's compliments, sir," he said, handing out a sealed packet.

Von Hasebrouk tore open the envelope and read. Then he gasped with emotion. *"Mein Gott!"* he choked. And then, *"Mein lieber Gott!"* he almost sobbed, "What shall we do?"

The staff gathered around him enquiringly.

"Listen!" began Von Hasebrouk, in a trembling voice. "'General Headquarters, Ninth Army Corps, St. Menthonne. An Imperial Zeppelin is to arrive tonight at Pont-les-Clayes, behind the ridges to the rear of your position. The utmost secrecy must be maintained as to its whereabouts until such time as it shall be launched upon a raid upon the enemy's ammunition base to the rear of Craonne. You will do everything in your power to assist Colonel Count Von Rheinfels commanding this Zeppelin, and are in particular cautioned to guard against the enemy's spies learning anything of the existence of this airship.

"'(Signed) Von Slausen, Lieutenant General Commanding Ninth Army Corps, Army of the Rhein.'"

There was silence for several seconds after Von Hasebrouk's voice died away. He glanced at the row of blank faces in front of him, as if searching there for a way out of the difficulty.

"Gentlemen, what shall we do?" he appealed piteously.

"Ach!" muttered the Bavarian under his breath, "Prussia is quick enough to howl when cornered! There is one thing you can *not* do, my dear Captain," he declared, raising his voice, "and that is to admit to the Old Fox that we're likely to leak."

"Absolutely! One thing is certain, Pont-les-Clayes at least can *not* be seen from this chateau, my dear lieutenant; and I shall see to it, at once, that double sentries are posted at every point from which it *can* be seen."

He telephoned headquarters for further details and then went out with the rest of the staff to look over the approaches to Pont-les-Clayes, leaving Von Nurdenburg puzzling over the war map. Presently a small door to the left of the great chimney opened, and Marie de Veaugirard entered, her brown eyes glistening under long wet lashes. She glanced furtively at the big fire-place and looked anxiously around the room, stopping in some confusion upon discovering Von Nurdenburg sprawled over the map. The Bavarian's dark eyes dwelt upon her curiously as he raised himself hurriedly from the table. "Pardon, Mlle. De Veaugirard"—he paused awkwardly, eyeing her fixedly in silence.

"Er—isn't it—er—a bit chilly this evening?" he remarked lamely, glancing at the fire-place.

"Why, no, Monsieur, not so early in September," returned Marie. "Do you really feel chilly, M. le Lieutenant?"

"I really do, Mademoiselle," insisted the other artfully, "Er—what do you say

The room was filled with the deadly flashes and blinding smoke of his pistols

to a nice roaring fire in yonder chimney?" he suggested.

Her hand jumped to her breast, a slight, involuntary movement instantly suppressed, but it did not escape Von Nurdenburg.

"Mon Dieu!" she gasped, "Ah, bon! I shall ring for Pierre," she continued aloud, moving swiftly towards a small concealed push button in the side of the chimney wall.

Von Nurdenburg regarded her minutely. "*Mais, non!* mademoiselle, *je prie!*" he protested smilingly.

"Not to ring for Pierre?" questioned the girl wonderingly, "*Alors!* I shall go call him, then."

Von Nurdenburg blocked her way. "Pardon, Mademoiselle! It is unnecessary," said he inexorably. "I myself will call an orderly and have my men bring some logs."

For an instant the girl's self-possession deserted her. Then she pouted coquettishly. "Ah! I hate him! Don't you?"

"Who?" he breathed, answering her mood with his eyes.

"That Prussian," she waved a hand at the door whence Von Hasebrouk had disappeared.

"Oh?"

"You are not suspicious. You don't like him, I hope! Why I'm no longer mistress of my own household even, thanks to that *boche* captain's orders."

"Mademoiselle! You are mistress of me, though, and of anything I can do that you choose to command!" responded the Bavarian ardently.

"Do let me ring for Pierre, then. It is odious to me to see your soldiers in their great cowhide boots come tramping into this salon with heaven knows what loot they may have plundered for firewood."

Von Nurdenburg bowed profoundly. "Ah, Mademoiselle, I am *desoleé, desoleé!* but I can not permit you to touch that button! What that electricity may do, where it will go we know not; it exceeds my duty to permit you to."

"Ah, brave Bavarian!" taunted Marie, "afraid of a common house push button for calling the servants! Oh, la-la!" she laughed merrily, shrugging her shoulders. "May I not even call him, then?" she enquired with a delicious note of sarcasm in the rising inflexions of her voice.

The Bavarian felt a mad wave of desire for her sweep over him. What scheme wouldn't he compass to mould that girl to his wishes! To crush that lithe form to his breast; to fold that little head with its raven curls into his arms! Ah....! He mentally blew a kiss to the ceiling.

At this juncture Pierre himself appeared. "Pierre!" commanded Marie, arching her eyebrows meaningly, while Von Nurdenburg hesitated. "Bring fire wood!" she ordered, pointing to the huge fire-place.

Pierre looked blank consternation for an instant, then, collecting himself under her meaning glances, "*Oui, oui, mademoiselle; j'en fais, tout de suite!*" He muttered something to himself and hobbled hurriedly out of the room.

Marie turned to the Lieutenant blandly. "You see, Monsieur le Lieutenant, it is so simple!"

Von Nurdenburg looked at her relieved. This girl could be no spy; she meant no harm. If it was sight espionage that they were undergoing, she at least was in no position to see or communicate anything. If wireless espionage—but that was impossible. He waved the thought from his mind as unreasonable; no aerial of any kind in sight, no place of concealment for any possible sending and receiving set that had not already been thoroughly searched by his men. Besides, Pont-les-Clayes, where the Zeppelin was to land, was so far down behind the hills of the Aisne as to be out of reach of all the French field batteries, out of reach of anything but the dropping shells of the great 45-centimetre howitzers of the French, seven miles away at Craonne. And how could she possibly communicate with them? Better a conquest of this girl, now that he had the chance, than to worry about her being a spy. His eyes softened as he turned them upon her again in the deepening twilight. All was quiet along the front, not even the occasional bark of a field piece interrupting the silence

as the soldiers on both sides set about their evening meal.

"Ah, mademoiselle, but can you forgive me?" he began, his eyes glowing ardently upon her. Marie could read eyes as well as any girl that ever wore an aigrette, and she proceeded to devil the susceptible Lieutenant still further.

"If," said she archly, "Monsieur will do me a little, just a little favor, he *shall* be forgiven!"

"Anything! Anything within my duty as a soldier, Mademoiselle!" agreed the officer eagerly.

"Would it be within Monsieur's duty as a soldier," pouted Marie, "to look out of the window and see if we have a chicken left in the garden for dinner tonight?"

"It shall be done, little one!" responded the other. "And then, may I claim a little reward Mademoiselle?" he suggested burningly.

"Perhaps!" murmured Marie, demurely.

"Ah!...." He tiptoed swiftly to the window and peered out into the garden. Marie snatched up the yellow headquarters despatch still lying on the war map, read it and replaced it carefully before Von Nurdenburg turned.

"Aha! There *is* one, Mademoiselle; a fine rooster. We shall have him tonight with some excellent champagne that our soldiers—" He paused and blushed as he saw Marie's face darken. "A thousand pardons, Mademoiselle, for mentioning that wine! It is very unfortunate that we should have—er—taken it. May I be again forgiven?"

"Listen, Monsieur," said Marie suddenly, "do you hear nothing?"

A faint distant buzz, like the hum of a droning bee penetrated the room.

Von Nurdenburg started. "One of your daring airmen, doubtless, mademoiselle," he laughed gallantly.

Marie chuckled, a gentle teasing little laugh. "*'Ein voglein kommt geflogen'* Monsieur, perhaps," she quoted softly.

Von Nurdenburg whirled about swiftly, a gleam of awakening suspicion in his eyes. They fell upon the scrap of paper still lying on the war map. *Pst!* The Headquarters despatch! How could he have forgotten it! Could she have read it?

"What do you mean, mademoiselle?" he demanded harshly, "I do not in the least understand what you are talking about."

Marie tilted back her chin and smiled at him provocatively. "Oh, la-la!" she derided, "don't we in France know the hum of an aeroplane as well as you in Germany? It is nothing, nothing to go into a temper over. Listen! There, it comes to rest, Monsieur le Lieutenant, if you please."

"An aeroplane," repeated Von Nurdenburg, watching her narrowly, "or, Mademoiselle, a——?"

"Or a ——" she shrugged her shoulders, "Zut! the what-you-call-him—Zep—you finish it!" she ended in adorable helplessness.

Again Von Nurdenburg felt relieved. Surely she knew nothing of the despatch; or else she must be a consummate actress. His hand grasped the yellow slip and he tossed it over to her. "Or this!" he remarked nonchalantly.

Marie's eyes grew wide as she read it, Von Nurdenburg watching her closely.

"The barbarians!" she gritted under her breath. Then, suddenly aloud, "Oh, Monsieur, but you have been indiscreet! You have been cruel! You have deliberately made me a—a spy!" she gasped.

"Precisely!" grinned the officer, "Mademoiselle de Veaugirard you know too much! You can never, now, be out of my sight! You are under ar—"

"Oh, Monsieur!" she flashed at him beseechingly, reproachfully.

"Unless—" breathed Von Nurdenburg.

Marie started. "Unless?" said she wonderingly.

"Unless," returned Von Nurdenburg softly, opening wide his arms, "you come over to our side—to *my* side!"

Marie raised an arm as if to ward him off. It had grown quite dark and she looked about anxiously for help. Then a faint tremor shook the building, and at intervals, another, and yet another, while faintly came the distant boom of heavy artillery.

"My God! What was that?" exclaimed the Bavarian, his eyes distending with horror.

Marie stiffened. "That, Monsieur," said she icily, "is the sound of *our* 45-centimetre howitzers!"

Followed the shrill whistle of huge shells high overhead, and almost instantly the detonating crash of bursting shrapnel, to the rear of the chateau—at Pont-les-Clayes!

Von Nurdenburg tore his hair. "You devil!" he burst out at her, "you knew! You read that despatch and got word to your people somehow—I don't know how—but you shall die for it! Tell me how you did it instantly before I shoot you dead!" he stormed, drawing his automatic and levelling it at her.

Into the room just then crept old Pierre, upon his face an expression of regret. "Mademoiselle," said he deprecatingly, "I am *desoleé,* but there is no fire wood."

"Enough!" shouted Von Nurdenburg, "Hans! Rudolph! Heinrich!" he ordered as the sentries rushed into the room. "Seize that man! Mademoiselle, you are under arrest! Don't dare to move a step! Don't move so much as an eyelash! Heinrich!" he added to the third guard, "get a hand grenade and explode it up that chimney. I'll find out what all this mystery is about, and that damned quick."

Marie gave a stifled scream. Immediately Von Hasebrouk and the staff burst into the room, "Ruined!" he shouted, "the Zeppelin's ruined! Shot to pieces with the enemy's 45-centimetre shells within ten minutes from the time she landed at Pont-les-Clayes! Arrest that woman! Von Slausen will be here in three minutes, and—*Ach, Gott!* we'll all be court martialed! Arrest that woman, I say!"

Three burly guards laid hands on Marie. Von Nurdenburg started to intercede. "Pardon, my captain," said he deprecatingly, "but it is unnecessary. I have already placed her under arrest; I *know* that she has had nothing to do with this, for she has been under my sight every minute since you left this room. I beg of you not to make her endure the indignity of being seized and held by our common soldiers; consider her noble birth—"

Von Hasebrouk swept him with a scornful glance. "Yes, Lieutenant," retorted he cuttingly, "*do* spare the feelings of our beautiful enemy!" He saluted her sarcastically. "You lovesick saphead!" he continued roughly, turning upon Von Nurdenburg, "I do believe *you* have had something to do with this also. Consider yourself under arrest!"

Von Nurdenburg half drew his sword, replaced it and fumbled furiously for his card. "At your service, sir! Any time, any place, any weapons!" said he bitterly, flinging the card in the other's face.

The door beside the chimney opened and General Von Slausen—called by the Ninth Corps the Old Fox—stood in their presence. He glowered for a full breathless minute upon the flustered officers, his chest heaving with suppressed agitation. "Having lost His Majesty's Zeppelin; having failed most lamentably in your duty, young gentlemen, may I enquire as to the meaning of this scene?" he demanded in his thin, sarcastic, inflexible accents.

Discipline thrown to the winds, every officer in the room started to explain at once.

"Silence!" thundered the irate General, holding up his hand. "Captain Von Hasebrouk! I believe that you command this—er—assemblage," prompted the Old Fox sardonically.

Von Hasebrouk clicked his heels together in military salute. "Sir, if you will bear with us but for a moment," he begged, getting his wits together, "I believe we have here the solution of a mystery that has been troubling this section of our line for some time past."

"I do not understand," interrupted Von Slausen unsympathetically, "what mystery? Why was it not reported to Headquarters before?"

"Will the General please pass over that point for the present? I will gladly go before court martial for it later," beseeched Von Hasebrouk. "This woman—"

The General nodded impatiently, tapping his foot in unwilling permission for

the unfortunate officer to proceed. "This woman, this chateau, I mean—we are convinced, has some secret way of intercepting messages and collecting information and passing it on into the enemy's lines. We are sure of it now."

"Yes; now that His Majesty's Zeppelin is gone!" barked the angry General, "Why was I not told of this before? Might not my poor brains have helped the astute intellects of you young gentlemen to have stopped this leak?"

"Sir, I beg of you!" pleaded Von Hasebrouk. "Let me now give you the facts: Sometimes the enemy appear to be informed of such of our troop movements or battery emplacements as can be seen from this house; sometimes of things which obviously can *not* be seen from here, such as for instance the attack of the Zeppelin just now. Even your war office messages from Nauen to headquarters appear to be known by the enemy immediately opposite us even before your messages come to us, sir, by orderly or telephone. And I'm convinced, sir," he concluded, "that this girl, here, is somehow at the bottom of it, or at least knows something about it."

"Who is she?" asked the Old Fox.

"She is Mademoiselle de Veaugirard, daughter of the old Count; she has remained at the chateau after her family fled to Paris before our advance."

"Reason?" queried the Crafty One.

"Her younger brother is buried here, I believe; killed in an action with our Uhlans down the road a bit."

"Humph!" ejaculated Von Slausen sardonically, "a fine reason, a pretty reason, my young gallants!"

The staff winced in silence.

"Seems reluctant about having a fire built in that big south chimney yonder," put in Von Nurdenburg traitorously.

Marie stole at him a glance of inextinguishable hatred.

"That's all right!" turned the Old Fox with cheerful savagery, "have a hand grenade full of deadly gases exploded up the chimney and that'll smoke out any spies you may have harbored there."

"That has been ordered done, sir. And she seemed very anxious to press that little button on the chimney a while ago, too," added the Bavarian, eyeing Marie maliciously.

Marie never wavered as they all scrutinized her closely.

"Young gentlemen, this is all beside the point," declared Von Slausen decisively, bringing down his heavy sabre with a thud and crossing his hands upon its hilt. "To my mind it looks like a clear case of wireless espionage, and the apparatus must be concealed somewhere in this building."

"But sir, there's not a yard of aerial wire in sight anywhere," expostulated Von Hasebrouk, "let alone a sending and receiving set that could take Nauen."

"All right. It's here just the same. And if you gentlemen can't find it, this girl can be *made* to tell you where it is if any of you had the gumption to make her. She can tell you, and she *shall!*" gritted Von Slausen, "for it's clear in my mind that she has furnished the eyesight information to the concealed operator, wherever he may be. Is it not so, girl?" he demanded roughly, turning suddenly upon her.

Marie regarded him with flashing eyes. "Monsieur le General!" her clear voice rang out, "I know nothing of what you speak; but, sir, as I am a de Veaugirard, sooner than reveal a military secret of my country, I would hang for it gladly!"

"My dear young lady, you *shall* hang for it, and that at once! But, before you pass from among us, you shall tell us of this wireless; or else—do not mistake me, mademoiselle—you shall be given to these, our common soldiers, you, a de Veaugirard, to do their brutal will upon you, unless—"

"Infamous!"

"Certainly, but war! Choose, mademoiselle, and that right quickly!"

"Hang me! Let me die, Monsieur le General! Gladly will I give an innocent life for France!"

"You shall die a thousand times, mademoiselle, before our soldiers are through with you, unless you tell us of this wireless," exclaimed Von Slausen brutally. "Choose!"

Marie bit her lip and faced him bravely in silence.

Von Slausen waved his hand and the

grinning guards advanced. She fought them with all her strength, while the officers stood about, silent and cynical. One great brute clasped her about the waist and imprinted a kiss upon her cheek.

"Etienne!" she screamed in a voice of piercing agony, *"Etienne!* Help! Save me!"

There was a thud of feet in the fireplace, and a young French lieutenant of the Line crouched before them, an automatic levelled in each hand. He wasted not a word, but opened fire at once. The room was filled with the deadly flashes and blinding smoke of his pistols. Von Slausen reeled and tumbled where he stood; Von Hasebrouk fell in the act of drawing his automatic; the three soldiers dropped Marie and dashed for their rifles outside; Von Nurdenburg bolted incontinently through the door with them, completely unnerved; and the last survivor of the staff collapsed where he stood, shot through the heart.

De Veaugirard slammed shut the door and locked it, grabbed Marie's hand and fled with her over Van Slausen's body, out through the chimney side door and up the dark, rear stairs to the second story.

"Courage, sister!" he gasped, "Henri de la Rochette is coming for us in his monoplane! I wired him when I overheard your row downstairs. If we can hold the roof for ten minutes all will be well. Have you anything about you that can shoot?"

Marie showed him an automatic, fully loaded. "Von Hasebrouk's—I picked it off the floor as we went out!"

"Good! Ten good shots! Come! *Vite!"* They ran up to the third story, opened a dormer window and stepped out on the great copper gutter of the red tiled roof.

"Quick! In behind the chimney! Crouch down, now, close as you can between the tiles and the chimney!"

De Veaugirard kicked the copper gutter with his heel. "Good bye, old friend!" said he, "the best concealed aerial a man ever had!" He laughed. "Marie, there's three hundred feet of copper gutter and flashing six feet wide, under the tiles of this roof, and with my instruments hooked into it for an aerial I could hear Nauen, and every word that they sent from the wireless aboard that Zeppelin. I told Craonne about her ten minutes ago—and you heard the result. And then all their aeroplane despatches, every headquarters order. *Fictre!* but one hates to give up a chance like that! But I couldn't abandon you to those brutes, dear, not even for France!"

"But your instruments in the cave in the chimney, Etienne? Do you think they will find them?"

"Oh, they're gone! *Les boches* will destroy them, along with the chimney and the house itself in a few minutes, as soon as their artillery begins on it! Listen to the tremendous row down in the street! Now their field batteries are opening up on this house. Hug down close, little sister, or the shrapnel will get you!"

The chateau began to quiver under the impact of shells striking its walls, and presently the acrid fumes of smoke from the burning house floated up around the eaves of the roof.

"Tiens! But we shall be grilled like pickled herrings if De la Rochette doesn't hurry!" quoth De Veaugirard cheerfully. "Here he comes now!"

Far across the valley of the Aisne appeared a little, flying speck. With incredible swiftness it swooped towards them, growing larger and larger every minute. The German picket line opened fire upon it, and then the skirmish line of sharpshooters, but still the monoplane kept on. Next a spattering fire arose from the trenches of the main line, and a battery on the hill elevated its muzzles hastily and belched a shower of shrapnel upon it.

Suddenly the monoplane stopped. "Ah, ah! Mon Dieu! Let me die! They've killed him! My Henri! The devils! The devils!" screamed Marie hysterically.

"Mais, non!" exclaimed her brother, roughly. "Keep down, foolish! He's only shut off the motor and is volplaning. Get ready to jump, quick!"

Etienne rose and clambered to the tiled ridge of the flat topped roof. Suddenly a trap door some twenty feet

away burst open and two German soldiers with their rifles poked up through the opening, one of them levelling his rifle at Etienne. Marie opened fire on him with her automatic, while De Veaugirard turned and fired also. There was a swift interchange of shots and when the smoke cleared away the hatch was empty. Marie clambered after her brother as the monoplane soared down upon them. For a single instant the De Veaugirards were silhouetted on the flat top of the red roof, while rifle bullets from below whistled all about.

"Grab for any part of the frame you can reach, he will not stop," commanded De Veaugirard, raising Marie in his arms. "Now!"

As the monoplane slowed down and hopped and bounded along the roof, they snatched and clung, while De la Rochette again started his motor. Then they went soaring upward in a great circle, while shots rang out far below. De Veaugirard clambered up into the car, and the two men pushed and pulled Marie after him into the machine. Up, up, higher and higher into the clouds, out of reach of rifle fire, soared the monoplane; then it turned toward a landing point far distant from the force that was menacing them—the encampment of the French Army.

"Never again will I get a concealed aerial the equal of that copper flashing roof," remarked De Veaugirard, after he had reported to his commanding officer. "But," glancing tenderly at his sister, "if ever the Army sends me on spy duty again, may I have a true blue pal, like you little girl, with me!"

And he clasped her in his arms while De la Rochette looked on with envious eyes.

DECREMETER OF INSPECTORS DESCRIBED

R. H. Marriott, radio inspector of the Department of Commerce, delivered an interesting address to the members of the Radio Club of America at a meeting of the club held at the East Side Y. M. C. A., New York. His subject was the Kolster decremeter as used by the inspectors of the Department of Commerce. A discussion of the principle involved and an explanation of the instrument, given in detail, was followed by an actual demonstration of its use.

The operation of the instrument described is based on the well known Bjerknes formula; namely, the measurement of the current flowing in a wavemeter circuit at resonance and the corresponding value of current with a decrease in resonance.

An important consideration in the construction of the instrument is that the variable condenser used is designed to have a straight line law of calibration, the capacity of the condenser increasing progressively and in proportion to the divisions of the condenser scale. It is thus possible to make the instrument direct reading, the value of the decrement being obtained by a simple observation of the deflection of the hot-wire wattmeter used as an indicating instrument. That is to say, the corresponding decremeter reading is obtained directly on scale geared to the variable condenser.

In addition to the facilities afforded for reading the value of the decrement, this instrument contains a crystal detector and head telephones connected unilaterally to the decremeter circuit for obtaining the point of resonance. The instrument also contains a buzzer excitation circuit by which the decremeter at once becomes a small transmitting set emitting waves of a definite frequency and may thus be used for the calibration of the receiving apparatus at a given station.

IN THE SERVICE

The copy book maxims warn young men against the folly of drifting, but once in a while there comes to light an instance of a man who drifts right into his proper sphere. Such a case is that of James M. Sawyer. Not that Sawyer pursued an aimless career; on the contrary. The turning point in his working life, however, came in 1902, when he was engaged in drafting and drawing. On one occasion he was asked to do some work for a wireless company and almost before he was aware of the fact he found himself actively engaged in the art. Today he is superintendent of the Maintenance, Repair and Inspection Division of the Traffic Department of the Marconi Wireless Telegraph Company of America, with headquarters in New York.

To begin at the beginning of Sawyer's life it will be necessary to go back forty-five years to Waterville, Me., where he was born. He received his education in that city, but opportunity summoned him to Boston when he was nineteen years old. Here he engaged in electrical construction work, becoming an employee of the Edison General Company. During the years that followed he spent part of his time in Boston and the remainder in traveling about New England, installing electric light and power plants. But the ever-active Opportunity wouldn't permit him to remain permanently in Boston and in 1896 he removed to Philadelphia, where he entered the electrical department of Wanamaker's store. A year afterward he became superintendent of construction for the Sawyer Electrical Company and when the company became the Standard Electrical Construction Company he was made president of the concern.

It was about this time that Sawyer got into touch with wireless in the manner referred to previously in this article, and as the days passed he found himself more closely identified with the radio field. It was not a great surprise, therefore, when in 1914 he became an employee of the International Telephone Company, which was formed in Jersey City, N. J., in that year. Incidentally he also took part in an indirect way in the war which was then being waged between Russia and Japan, for the latter ordered a quantity of wireless torpedoes from the International Telegraph Company and Sawyer was connected with the carrying out of the commission. When the company was absorbed by the United Wireless Telegraph Company he was placed in charge of the factory accounting department, becoming superintendent of the maintenance and repair department in September, 1911.

Upon entering the employ of the Marconi Company he was placed in charge of the Maintenance and Repair service. The scope of his work was broadened recently when the inspection of Marconi apparatus on vessels touching at New York was placed under his direction. Divisions similar to the one of which he is in charge, have been established by the Marconi Company in Boston, Philadelphia, Baltimore, New Orleans, Galveston, Chicago, San Francisco, Cleveland and other cities.

A Girl Operator's Story

The Trials and Delights of Wireless as Related by Miss Cecil Powell

Miss Powell and her set

This is the story of the early experiences and struggles in wireless telegraphy of a girl. She not only owns and operates a ¼ k.w. station in Hartford, Conn., but has passed the examination for a First Grade Amateur's License and intends to try to obtain a First Grade Commercial License. She is said to be the only girl wireless operator in Connecticut.

I AM a stenographer employed by an inventor. This may count for my liking for everything scientific or mechanical, especially the construction features.

My initial interest in wireless was due, I believe, to the fact that my employer had a station in his home where he frequently discussed radio work with a friend who was also a disciple of the spark. I enjoyed listening to them and my interest in the art grew. Finally I became imbued with the determination to take up the study of wireless.

On top of this resolve came a surprise. My employer and his friend, apparently surmising that I was ambitious to be more than a mere onlooker in wireless asked me if I would like to become the owner of a station. The question fairly swept me off my feet. But, of course, I answered in the affirmative, and almost before I was aware of the fact, I had become an active participant in the work which to me was so absorbing.

I was considerably excited when the day came for putting up my set. The aerial, to which we first gave our attention, consisted of two No. 24 cotton covered wires held by ropes in the branches of two trees about fifty feet apart. Then came my receiving set, shining and pretty. The first evening it was connected up, I was filled with elation. But this changed to despair when I heard the signals. It did not seem possible that I ever should be able to master those dots and dashes. My friends sent to me slowly, however, and after a time I was able to distinguish a dot from a dash.

My troubles were not at an end though, for when I reached home one evening a short time after my set had been installed, I discovered that my aerial was down. Investigation showed that one of the ropes holding the wires had been cut. Repairs should be made at once, I decided, and, notwithstanding the fact that the weather was far from fair, I enlisted the aid of the Man-of-Our-House and set about the accomplishment of the task. It was not an easy one by any means, but after two hours' effort, assisted by suggestions from the Lady-of-

Our-House, the aerial was restored to its former position. But not for long.

In the excitement of installing a transmitting set in my station this mishap was soon forgotten. With the aid of my wireless advisers a ¼-k.w. closed core transformer was constructed and, the other essential parts of the apparatus having been obtained, I began to work several stations in the neighborhood. For a brief period everything went smoothly. But one evening the No. 24 wires in my aerial succumbed to the force of a sleet storm and came down.

One of my friends in wireless whom I shall call Instructor A, heard of my ill-luck and volunteered to help me put up an aerial that would have stability as its main feature. With his aid I extended the wires from the roof of our home to that of a neighbor's, giving me about 300 feet of height and forty feet of length—a considerable aerial for a girl amateur. But the aerial did not remain in place and a few days later some of my other wireless friends—Instructor B, and the Man-of-Our-House—helped me to put it up again.

The difficulties with my aerial having been satisfactorily settled, I was now confronted with the problem of what kind of a gap to use. I had an ordinary open spark gap, but as I did not like the noise resulting from its use my friends decided that it would be advisable for me to substitute a quenched gap. I had little success with the quenched gap, however, and received several shocks. Concluding that the trouble was due to my condenser which had twenty glass plates, we made one of five. But this plan was not successful, so we took out the five-plate condenser and replaced the one with twenty plates. We also added one of fifteen plates. After that the results obtained were excellent.

My detector was responsible for some of my most exasperating experiences. On some occasions the signals would come in clear and distinct. Again I would answer my call, throw back my aerial switch and listen in vain for a reply. Then, while I was waiting, the last part of a message evidently intended for me would reach my ears. My sending would also throw my detector out; this invariably occurred when important communications were being transmitted.

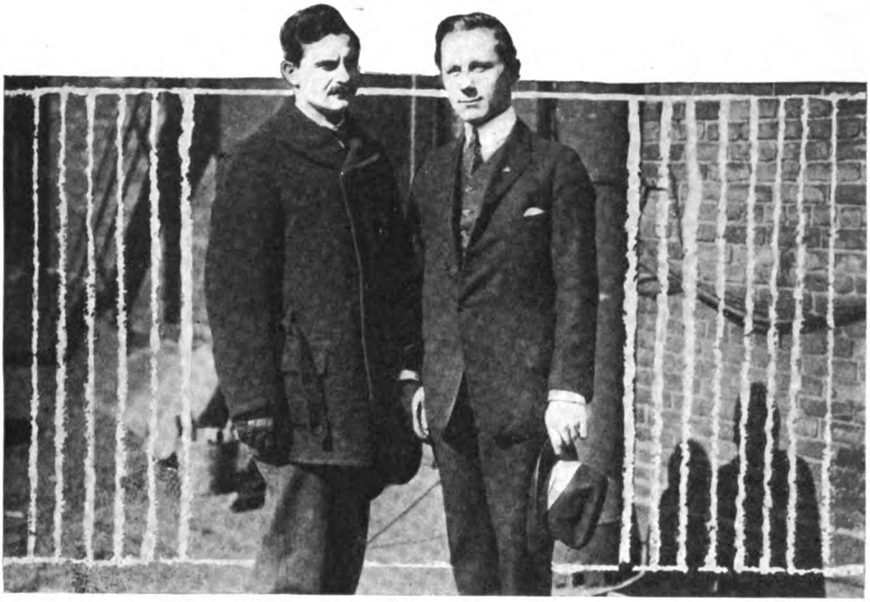
Before I bring to a close this account of my wireless impressions I intend to tell of a visit I paid one evening to Instructor A's station. He invited me to operate his set and I had been at the key only a short time when I received an answer to my call from a distant station. The operator there believed that Instructor A was sending. He was somewhat surprised, therefore, when he was informed that he was about to be introduced to a girl via wireless. To tell the story in brief, we enjoyed a chat lasting some little time and then another amateur made himself known by means of dots and dashes. This led to more introductions and before the evening was at an end I had talked with a considerable number of stations.

Exchanging thoughts by wireless is good fun. Moreover it has many advantages over verbal communication, the principal one being that it keeps folk with whom you are talking wondering what you look like.

Ithaca Amateurs Organize

An organization to be known as the Ithaca (N. Y.), High School Wireless Club, has been formed by fifteen pupils in the science department and Instructor E. D. Arnold. The object of the club will be to promote the instruction of wireless telegraphy in the High School. Membership will be open to all. A petition requesting the appropriation of $29.05 for the completion of the partly-erected apparatus on the roof of the school building was granted by the Board of Education at a meeting held recently.

The members expect to complete their wireless station in a short time. The big aerial will be erected from the big chimney to the central tower on the roof of the building, fully thirty feet out of reach. The lead wire will be stretched over the northwest wall through a window into the small room in the science department to be known as the wireless room. As an assurance of safety, a ground wire and lightning transmitter will be included in the apparatus.



Milton W. Grinnell and Arthur E. Ericson, Marconi operators imprisoned in Bremen

Prisoners of War

By Arthur E. Ericson

WHEN fate frowns and the putative swords hanging over our heads are on the verge of dropping, harbingers of possible peril generally appear. That was my idea of the way adventures begin until Milton W. Grinnell and I, Marconi operators on the steamship City of Macon, found ourselves locked up in a German prison as suspected spies. Then I realized that the most startling events can come like a bolt out of a clear sky.

Grinnell was detailed as first operator and I as second when the Macon departed from New York on December 29 last, pointing her nose toward the route which leads to Bremen, Germany. It was our first trip abroad and the voyage of course had somewhat more interest for us than the runs which the vessel had been making between Boston and Savannah.

Therefore we might be expected to look forward to the cruise with a few anticipatory thrills—especially in view of the fact that we were crossing in war times. But the days passed without anything out of the ordinary to mark them and we arrived on January 9 at Scilly Island light, Great Britain. Here we were stopped by a British cruiser. She would not respond to our request by wireless for instructions regarding how to proceed through the English Channel, however, and the captain of the Macon, deciding to communicate with her by means of Morse lamp signals, summoned me to the bridge to operate the light.

It was almost broad daylight, but I succeeded in establishing communication with the cruiser, and shortly afterward we steamed away for St. Helen's, Isle of Wight. The Macon arrived at St. Catherine's light late that evening and anchored, our captain determining to wait for daylight before attempting to steam into St. Helen's. While we lay there a British torpedo boat loomed up in the darkness and I was again

called upon to operate the flash-light. From the commander of the torpedo boat came a message saying that he had instructions to escort us into St. Helen's; that we should follow in the wake of his craft. The Macon, therefore, weighed anchor and felt her way through the night after the British vessel.

Arriving at St. Helen's, we were again compelled to lay to—this time for a pilot to direct the Macon to another point in the Channel where she was to take aboard still another pilot. A fog blocked our voyage, too, and all the next day we were compelled to remain at anchor, blanketed in the dense mist. On the following day, however, the heavy curtain lifted somewhat and we made preparations to continue our voyage. The pilot having boarded the vessel, the antenna was dismantled and the door of the wireless cabin locked. Then we weighed anchor.

At Yarmouth, where we stopped, the commander of the Macon was instructed to extinguish all unnecessary lights and to keep covered those which were essential for use. These precautionary measures were explained by the fear of the British officers that some Zeppelin, on a bomb-dropping raid, might mistake the Macon for a British steamship and select her as the victim of an attack. Steaming away from Yarmouth, the Macon headed for Whitby, where she dropped her pilot. Then she made her way toward the mouth of the Weser River.

It was at half past seven o'clock on the morning of the day that we arrived in the neighborhood of the Weser that the events directly responsible for the difficulties in which Grinnell and I became involved began to shape themselves. I was at breakfast when the first officer called my attention to an aeroplane swooping toward us. It provided an excellent opportunity for a snap shot and, hastening to our stateroom, I told Grinnell to come on deck with his camera. The aviator in that machine, it seemed to me at the time, was most accommodating. When he had approached within a short distance of the Macon, he shut off the power of his engines and volplaned still closer. Then he removed his headgear and surveyed the vessel from bow to stern. His curiosity evidently having been satisfied, he started his engines and continued on his way—but not before we had photographed him and the aeroplane.

The incident did not remain long in my memory—I was too much interested, perhaps, in the scenes that were unfolded as we steamed along. Passing Helgoland about noon, we arrived off the mouth of the Weser about two o'clock. Here we were boarded by pilots and marines, the latter being in charge of several officers. The Macon had not proceeded far when we approached a mine field. Our proximity to the nest of combustibles was heralded by an order for the members of the ship's company to go below. All of the blinds were closed also, this measure being taken to prevent us from locating the mines.

Just as we passed Bremerhaven the soldiers left the Macon to board a tug following in our wake and we were permitted to come on deck. The sight of the city nestling on the banks of the river suggested another possibility for a photograph and we operated the camera with considerable eagerness, our performance being viewed by the soldiers on the tug astern. No other incident worthy of mention occurred until we docked at Bremen. This was about half past eight o'clock in the evening.

The Macon had not been long at her dock when we found that using a camera in war times is embarrassing to say the least, this conclusion being induced by the visit of three detectives who came to investigate our photographic industry. Two days later Grinnell and I were taken off the vessel and, our cameras having been confiscated, lodged in a cell in the city. We were kept under the same lock and key for three hours and then I was escorted before a magistrate.

My examination was conducted with the aid of an interpreter, for the magistrate was unable to speak English. I

was asked many questions, a considerable number of which had to do with our voyage through the English Channel. The magistrate was anxious to know what I saw and how many warships the Macon had passed, but I was deaf to these questions. He was greatly interested also in the fact that at one time in my life I had been employed as an aeroplane mechanician. It is likely that the photographs which we took of the aviator just before we reached the mouth of the Weser had something to do with his questions. After my examination I was searched and again locked up—this time in a cell by myself.

Our adventure began to take a more serious turn on the second day of our imprisonment when one of my jailers informed me that "We have orders to shoot you at sunrise." If he made the statement for the purpose of frightening me, as I suspected, he was disappointed, for I assumed a look of indifference and appeared to be thoroughly absorbed in a book. The latter I finished reading on the fifth day I spent in prison. When I asked for another book I was handed a copy of the New Testament. Whether this was an ironical suggestion that I needed religious instruction or was intended to convey the idea that as a condemned man I ought to read the Bible, I was not able to determine.

Adventures as well as the prosaic happenings of life must have an ending, however. Thus when one of my guards came to me at seven o'clock in the evening of our sixth day in prison and motioned for me to dress I instinctively felt that finis was about to be written in our story. What kept me wondering and guessing, though, was *how* the story would end.

I was not kept long in suspense, for another guard, evidently appreciating my feeling of uncertainty, informed me that Grinnell and I were to be liberated. To my jailer I only said in a commonplace way: "Is that right?" I felt, however, as if a weight of hundreds of pounds had been lifted from my shoulders.

In the office of the prison my companion and I were given part of the money that had been taken from us when we were searched. In accordance with instructions we returned the following day and received the remainder of our cash.

It was without regret that we departed from Bremen on the Macon February 1. And as we steamed down the Weser I had ample time for reflection, my thoughts having to do chiefly with the difference in comfort between my stateroom on the vessel and the cells in the Bremen prison. These conclusions followed:

That taking photographs in Germany nowadays is synonomous with being taken by the police; also that I won't repeat my offense, at least not with the same camera, for it is still in the possession of the Bremen authorities.

Other War Incidents

Interesting details of the Falkland Islands battle are contained in a letter written by W. A. Lacey, Marconi operator at the station there. The letter has been made public in a newspaper dispatch from London. Lacey says:

"The Germans were well aware of the utility of the station, as a determined attempt was made to destroy it on December 7. This day must have been especially set apart by the meteorological deity in charge of the Falkland Islands weather, for contrary to our usual leaden skies and high winds the day was perfect. There was scarcely a ripple on the sea and the horizon was clear cut, both being helpful factors to our outposts in sighting the enemy and to our ships in the engagement which followed.

"At 7:30 A. M. smoke was sighted to the southward, which materialized into two enemy cruisers, and later the smoke of three others was seen. The first two, the Gneisenau and Nurnberg, headed

straight for the station until they were about four miles off, when they presented their broadsides to us and trained their guns on the power house. Their movements were clearly visible through glasses. Orders were given to abandon the station—not from the Germans, but from our governor—which we did, retiring about 250 yards west and taking shelter behind the rocks whence we had a clear view of the proceedings.

"As soon as we were clear the guardship in Stanley Harbor let go two twelve-inch shells at the foremost German cruiser, and considering that the enemy was not visible from the harbor, the shooting was admirable. The shells fell one just forward and one just aft of the Gneisenau, the next two were better. One hit the water right abeam of the Gneisenau, ricocheted, and landed aboard. The firing was directed from the observatory.

"The enemy did not appear to like being shot at from an invisible battery which outranged their guns, and they turned southeast to get out of range without firing a single shot at us. A parting greeting landed alongside the Gneisenau, which was by this time stern on. Survivors state that Admiral von Spee, who went down with his ship, was at a loss to know where those shells dropped from.

"Meanwhile our cruisers were forcing steam and put to sea before the Germans were lost to sight, the fast British cruisers preceding for scouting work. We reoccupied the station and started the engine for power, working with our ships. Immediately we touched the key all the Germans pressed their keys, making indescribable noises by altering their spark frequencies rapidly. It has never been my lot to receive through such a jungle, and I trust never will be again. Our signaling continued without interruption, despite their efforts.

"For about two hours pandemonium reigned in the ether. After all orders had been given by wireless, the working ceased until the Germans tried to communicate with each other and our fleet returned the compliment by jamming them, with what success we do not know. The Germans disappeared in a southeasterly direction with our cruisers in hot pursuit.

"At 3 P. M. Admiral Sturdee made a signal which would have warmed Nelson's heart, and one which should be recorded in the annals of the British Admiralty, 'God Save the King.' The signal was taken up and flung far and wide through space by each of the fleet in turn until it seemed as though it would never cease. I consider it a privilege to have been one of the few to hear the signal. Had the wireless been in vogue in Nelson's day no doubt his memorable signal would have been Marconied.

"Later the flagship signaled: 'Scharnhorst and Gneisenau sunk. Where are the others?' Immediately the news was received a wild cheer went up from the small band gathered in the power house and we felt justified in drinking to the King."

The White Star steamship Cymric which arrived in New York on April 6, received the wireless distress call flashed by the African liner Falaba which was sunk by a German submarine in St. George's Channel on March 28 with a loss of more than 100 lives. Captain Beadnell, of the Cymric said he went aboard the Falaba on March 26 in the dock at Liverpool to inspect her. The Cymric left the landing stage just ahead of the Falaba, the two vessels maintaining the same position as they steamed down the Mersey. They separated in the Irish Sea, the Cymric making for the westward to pass Fastnet for New York and the Falaba heading to the southward for Las Palmas. At seven o'clock in the morning of the day the Falaba was sunk the Cymric picked up the distress call sent by the former, which read, "Submarine alongside. Am putting off passengers in boats." Captain Beadnell wanted to steam at top speed to the assistance of the craft, but the instructions of the Admiralty forbid commanders of vessels to enter into the danger zone when the enemy's warships are near. Therefore he continued on his course. A short time afterward the Cymric's operator heard the response to the S O S from British warships.

How to Conduct a Radio Club

By E. E. Bucher

ARTICLE XIII

TO the extent that the receiving apparatus is concerned, tuning may be defined as the process by which the elements of a receiving set are adjusted to secure audible response from a distant transmitting station. To obtain signals of readable strength it is important that certain adjustments be made at the receiving apparatus for each transmitting station that will set up sufficient energy to make the head telephones of the receiving apparatus respond.

Commercial receiving tuners are fitted with a so-called "stand by" circuit. As the name, in a sense, implies, it is the circuit which wireless operators employ when "standing by" or waiting for a call from stations of different wave-lengths. The stand-by circuit of a receiving tuner generally employs a coupling of about 20 per cent. between the primary and secondary windings; this makes the set, as a whole, responsive to a fairly wide range of wave-lengths, but does not give the maximum intensity of signals for any particular wave-length.

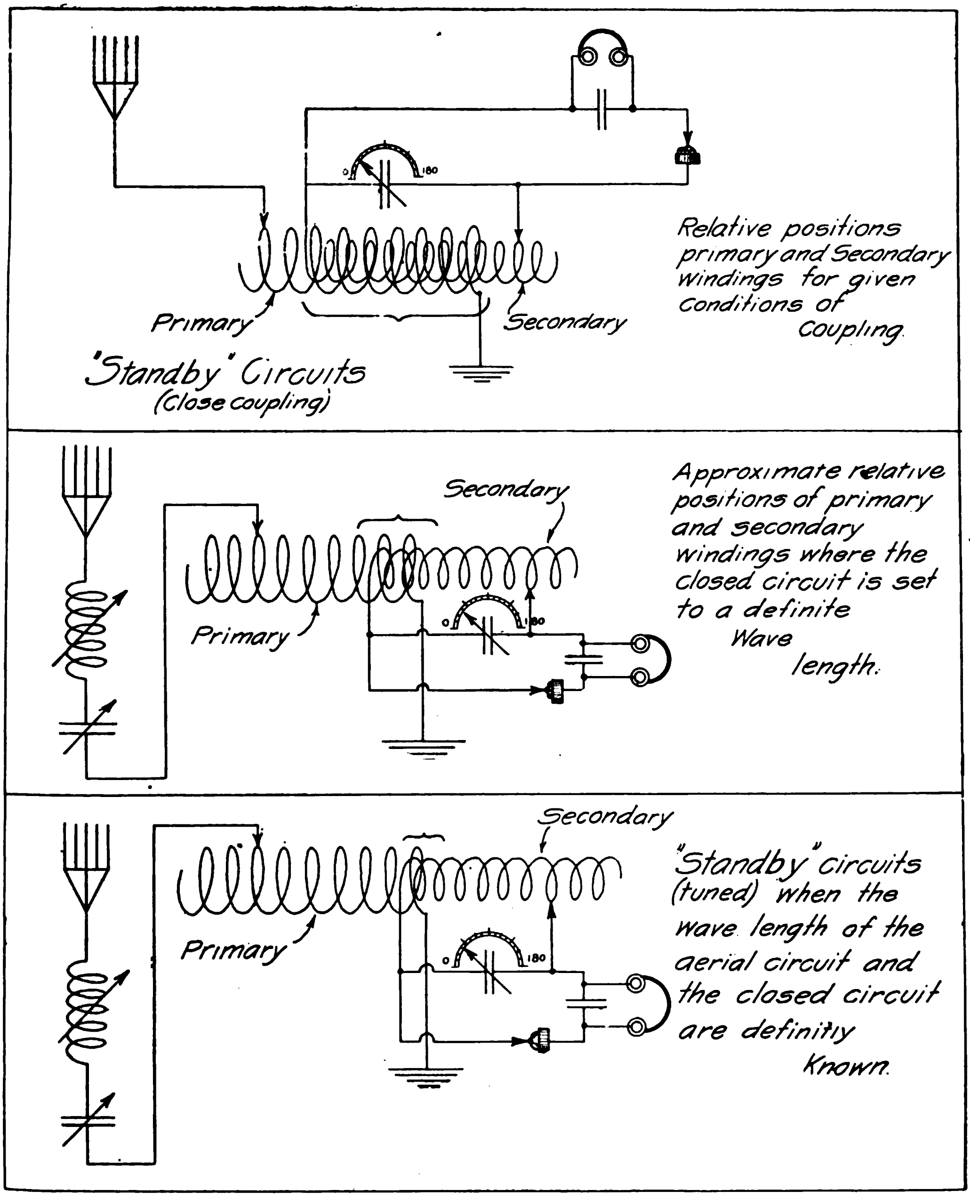
The writer does not wish to intimate that an infinite range of wave-lengths can be heard at a single adjustment of the inductance and capacity values of a given receiving set; there are limits in either the maximum or minimum values, but with the receiving tuners ordinarily employed in commercial or amateur work, it is possible to select such values of inductance or capacity in the primary and secondary circuits that the set will respond to wave-lengths over a certain small range, although not with the maximum strength of signals or over the maximum distance that these transmitting sets might carry otherwise. When signals are thus heard, however faintly, the variable elements of the tuner are then altered to suit the characteristics of the wave of the distant station until the maximum of response is secured.

It is a matter of some importance when employing the "stand-by" circuit that the condenser in shunt to the secondary winding of the receiving tuner be set at a zero or nearly zero value of capacity. In fact with the average tuner the addition of capacity at that point under conditions of tight coupling (between the primary and secondary circuits) is detrimental to the strength of signals except in certain cases where it may be necessary to secure a closer adjustment than is obtainable by the use of the multiple point switch alone.

"Stiffening" the Circuits

Unless the antenna circuit includes a considerable amount of localized inductance it is apt to be a fairly highly-damped circuit for reasons other than those due to the absorption of energy by the local detector circuit. On account of its inherent radiating properties, a portion of the energy collected by the antenna from a passing electro-magnetic wave is reradiated into space and the oscillations therefore do not attain the amplitude that might be obtained under more suitable conditions.

With a given aerial, as inductance is added in series, provided the high frequency resistance does not exceed a certain critical value, the aerial is given a more defined time period of vibration, making it more responsive to electromagnetic waves of a given frequency. Hence it is observed that it is less difficult to separate stations having different wave-lengths or different characteristics.



Figs. 1, 2 and 3

Suppose, for example, the aerial at a given receiving station is of such proportion that in order to reach a certain wave-length only a small value of inductance is required to be connected in series at the primary winding and, furthermore, interference is experienced from some foreign station the emitted wave of which is "broad"; then the circuits at the receiving station may be "stiffened" in the following manner:

The wave-length of the antenna circuit is decreased to a definite value by the insertion of a condenser in series and then restored to the original value by the addition of inductance at the aerial tuning inductance. If the value of the capacity of the antenna is thus decreased, and the value of inductance increased, the decrement of damping is decreased. In other words, when an oscillatory circuit is stiffened by the

method just described, interference from unwanted wireless stations of other wave-lengths is reduced to a minimum. This is an adjustment of prime importance with which all radio operators should become familiar.

Conditions for "Stand-By and Tuning" Adjustments

The conditions of a receiving tuner to be responsive over a small range of wave-lengths may be tabulated as follows:

(1) An antenna of such proportion as to have a minimum value of localized inductance for adjustment to a given range of wave-length.

(2) Close coupling between the primary and secondary windings of the receiving tuner.

The conditions of the receiving tuner for the best syntonic effects are:

(1) A small aerial "loaded" with a considerable value of inductance for adjustment to given wave-lengths, or

(2) With a given aerial, the insertion of inductance in series and also capacity in series to maintain normal adjustment of wave-lengths.

(3) A small value of coupling between the primary and secondary windings.

(4) The employment of a condenser in shunt to the secondary winding (under conditions of loose coupling).

The condenser in shunt to the secondary winding gives increased strength of signals when the coupling between the primary and secondary windings is small or of low value. In this case the condenser acts as an energy-storing device for the secondary current and will increase the amplitude of oscillations.

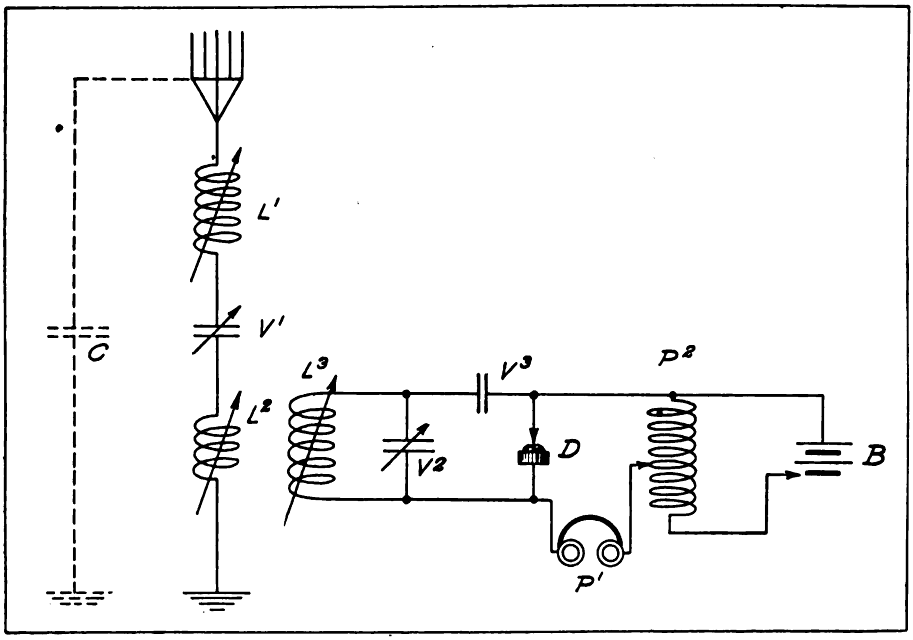


Fig. 4

The wireless operator often observes that it is possible to separate two stations at his receiving tuner having identical wave-lengths. In some cases this is due to the fact that the signals from one of these stations is stronger than from the other, but in other instances these results can be obtained on account of the fact that two transmitting stations may have identical wave-lengths but may have different characteristics.

When a receiving set is calibrated, it becomes at once apparent that the receiving apparatus may be adjusted to a given wave-length with several adjust-

ments of inductance and capacity in either the open or closed circuit. The one, therefore, to be selected is that which will give the receiving station similar characteristics to the sending station. Also, when the apparatus is adjusted to the wave-length of a given station, interference may be experienced simultaneously from another station of different wave-length owing to the two degrees of freedom of oscillation (under conditions of tight coupling). Should this be the case, the open and closed oscillation circuits of the receiver must be individually adjusted to the wave-length desired and the degree of coupling between the primary and secondary windings be at a minimum value or as is consistent with the strength of received signals.

To avoid a "broad" adjustment in the secondary circuit of a receiving tuner, the conditions necessary in the primary circuit hold, namely, inductance should predominate and the capacity should be of small value.

The Practical Adjustments of a a Receiving Tuner

We shall briefly consider three methods for the practical adjustment of a receiving tuner as follows:

(1) Where the primary and secondary circuits are not calibrated in advance.

(2) Where the secondary circuit is properly precalibrated.

(3) Where the primary and secondary circuits are individually precalibrated, and a chart of wave-length adjustments supplied.

With the conditions of (1), adjustments to stations of various wave-lengths can only be obtained by experience and experiment.

The method of procedure is as follows:

(a) Very close coupling should be employed between the primary and secondary windings.

(b) The condenser in shunt to the secondary winding is set at zero.

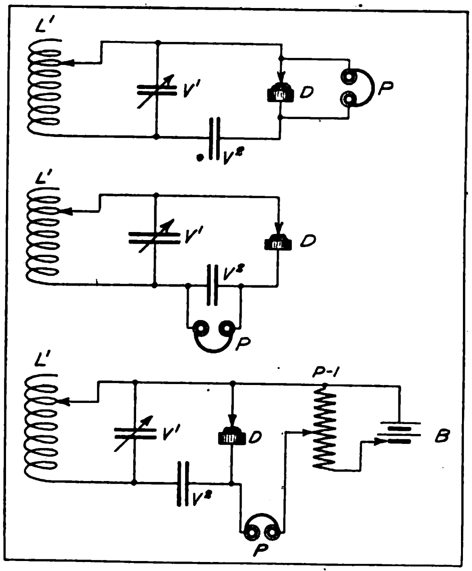
(c) About one-half the value of inductance furnished with the secondary winding should be connected in the circuit.

(d) The inductance in the antenna circuit is altered until the signals from the desired station are heard.

When the signals are thus heard:

(a) The inductance in the secondary winding is altered to ascertain if increased strength of signals can be obtained.

(b) The coupling between the primary and secondary windings is slightly decreased and a smaller value of inductance included, followed by a slight increase of capacity of the condenser in shunt to the secondary winding.



Figs. 5, 6 and 7

(c) The antenna circuit is "stiffened" by the method previously described.

In this manner stations, the wave-lengths of which are definitely known, may be brought to the maximum strength of signals and the corresponding positions on the inductance and capacity scales tabulated for future reference.

The adjustment of the receiving tuner to a station, the wave-length of which is definitely known, under the conditions outlined in (2), is a simple matter. In this case, the secondary winding of the receiving tuner has been precalibrated and a chart showing the values of inductance and capacity necessary for a given wave-length is furnished. The method of procedure is as follows:

(a) For the wave-length desired, the inductance and capacity values at the secondary winding are so selected that the inductance predominates and the capacity used is at a minimum.

(b) A fair degree of coupling between the primary and secondary windings is employed.

(c) The inductance in the antenna circuit is altered until the station desired is heard.

(d) If interference is experienced, the antenna circuit is stiffened by the method described.

Under the conditions imposed in (3), the receiving operator may adjust both circuits in advance to the wave-length desired, with the assurance that a calling station will be heard without variation of the variable elements of either circuit.

By reference to the chart furnished with the set:

(a) Such values of inductance and capacity in the antenna circuit are selected as will give the wave-length desired.

(b) Selections for the same wave-length are made in the secondary circuit.

(c) A medium degree of coupling is employed between the primary and secondary winding.

After the desired station is heard, either the primary or secondary circuit may be "stiffened" as desired.

When the condenser in shunt to the secondary winding of the receiving tuner is set at the zero position and tight or close coupling employed between the primary and secondary windings, it is often observed that the secondary circuit will respond violently to a definite wave-length, but not at all proportionately to other wave-lengths. In certain cases this is due to the distributed capacity of the coil. Every coil of wire has distributed capacity, namely possesses the property of storing up energy in the form of electrostatic lines of force between adjacent turns. With coils of a certain length, this capacity may attain to such value as to give the coil a distinct time period of vibration. Hence, when wave-lengths similar to the natural period of the coil are received and the entire coil is in use the maximum intensity of signals is obtained; but if only a portion of the coil is employed, and the wave-length is obtained by placing a condenser in shunt to the used portion, considerable energy losses may result.

To afford the student a clearer idea of the conditions under the three methods of adjustments described Figs. 1, 2 and 3 are published.

Fig. 1 shows the circuits of a receiving tuner for "stand-by" work. In this case about one-half the value of the secondary inductance is employed and the condenser in shunt is set at the zero position. The used turns of the secondary winding are placed directly underneath the used turns of the primary winding; hence, a close coupling is effected.

In Fig. 2 the wave-length of the closed circuit is definitely known, and a small amount of the capacity of the variable condenser in shunt to the secondary winding is employed. The used turns of the secondary winding are placed partly inside the used turns of the primary winding, the degree of coupling being fairly "loose."

In Fig. 3, the wave-length of both the open and closed circuits is known, hence a small value of coupling is employed.

Fig. 4 is a diagram comprising the fundamentals of a receiving set which appeared in the April issue of this series.

Receiving Detectors

The adjustment of a receiving detector to the maximum strength of signals is largely a matter of training and experience. This is particularly true in connection with the crystalline detectors for which definite instructions cannot be given for the location of the most sensitive point.

There is some difference of opinion as to the actions taking place in these detectors during the reception of signals. It is beyond the scope of this paper to enter into a complete discussion of the subject, but we may consider briefly the actions of the crystalline detector as used in certain circuits.

In Fig. 5, L-1 is the secondary winding of a receiving tuner, V-1 the condenser in shunt, V-2 the fixed condenser, D the crystalline detector, and P the

head telephone. The energy stored up in the condenser, V-1, is released in the form of high frequency electrical oscillations which flow readily through D in one direction, but are opposed in the opposite direction on account of the rectifying properties of the crystal. Thus in a single series of incoming oscillations the condenser, V-2, is charged by the impulses of the wave train and, owing to the preponderance of current in one direction (on account of the rectifying action of the crystal) the opposite coatings in the condenser, V-2, are charged to a definite polarity. On the completion of the charge (which has accumulated during a wave train), a discharge takes place through the inductance, L-1, and the head telephone, P, causing a single sound.

Under the conditions shown in Fig. 6, the condenser, V-2, is charged by a series of direct current impulses through the rectifying action of the crystal, D. The accumulating charge of the pulses thus produced by single wave train discharges aperiodically (in one direction) directly through the head telephones, P, creating a single audible sound.

When the receiving detector is supplied with an auxiliary battery circuit, as shown in Fig. 7, the actions are as follows: In this case, the current from the local battery, B, is caused to flow through the crystal, D, and the head telephones, P. The current flow through the crystal and head-phones is regulated by the potentiometer, P-1. When connected in this manner during the reception of signals there is superimposed upon the direct current already flowing through the crystal an alternating current of high frequency. If the flow of battery current is adjusted to a certain definite value, the alternating electromotive force pulses in one direction will cause a considerable rise in the value of current flowing through the head telephones from the local battery and the impulses in the opposite direction will cause a slight weakening of the circuit from the local battery. Owing to the fact that the added voltage through the head telephone circuit is greater than the subtracted voltage, the total effect is an increase of current through the head telephones from the battery. In other words, the head telephones are traversed by a series of impulses of increased strength, corresponding to the spark frequency of a distant transmitting station.

Thus it is evident that the head telephones are not operated directly by the energy from the aerial circuit, but this energy is employed to increase the current from a local battery circuit.

The sudden increase of current from the local battery circuit is not entirely due to the fact that voltage is added in one direction and subtracted in the opposite direction, but is also accounted for by the peculiar characteristics which all crystalline detectors possess, namely, in respect to conduction they do not obey Ohm's law; that is to say, the current flowing through the crystal at first does not increase directly with an increase of electromotive force, but after a certain critical potential is reached the rise in current is considerably greater than the value to be expected from Ohm's law. In actual operation sufficient battery current is allowed to flow through the crystal, D, to reach the critical point referred to. For closer investigation, the reader should be familiar with the plotting of the volt amperage characteristics of non-uniform conductors.

(To be continued)

RENEWAL OF LICENSES

The Bureau of Navigation announces that applicants for renewal of station and operator licenses must submit the originals of old licenses with the application for renewal. Service records of the operators must be kept complete at all times on the back, giving the time of service at all stations at which they are employed.

A fraudulent entry on the reverse side of an expired license was recently detected at the Philadelphia Navy Yard and the operator's license was suspended for a period of three months.

Gano Dunn has presented the College of the City of New York with a new wireless set to be used in the radio-engineering course.

Monument to Juarez in Alemada, Mexico City

MEXICO
as I saw it
by J Edward Jones

THE LIGHTHOUSE AT VERA CRUZ

MEXICO CITY DURING BOMBARDMENT

A Handful of Experiences and Observations of Mexico and Mexicans in Peace and at War

J. Edw. Jones, Marconi Operator

MANY of my fellow operators have told of their experiences in the West Indies and the Central and South American countries, but only once have I read in THE WIRELESS AGE an operator's experience in Mexico. This surely cannot be the fault of the material for, limited as my knowledge is, I can see that there exists no more interesting place nor more interesting people on which to base an amateur literary effort. It so happens that my career as a wireless man has brought me in close contact with the land of the Toltec and Aztec, and as best I can, I shall set down from my diary and from memory what I have seen and heard.

My first assignment in the wireless service was to the Texas, of the Swedish-American Line. She was lying at Newport News and I journeyed there from New York in the comfortable Old Dominion steamship Princess Anne. There was a gay party aboard, some charming passengers and a general air of good fellowship; in sight of the Virginia shores my career-to-be looked highly promising.

How different was the reality I faced a few hours later! The Texas was certainly no beauty; and my visions of mighty passenger ships and gaily chatting people, ambling about the deck to strains of soft music—you know, all the novelist stuff—well, they just weren't there. Sparing you further details of

my sensations, let it suffice that I gulped down my disappointment and manfully and straightway reported to the captain. And he told me I wasn't wanted! In broken English I was given to understand that he had one operator and did not need another.

I explained that it was the first day of October, 1912; the date when the law calling for two operators on certain ships became effective. He knew nothing of it; furthermore, he doubted. I could see that, very plainly. After some moments of suspense, however, I was told: "You stay here, ann-e-way; wait till I find from my company's agents if dis ting iss true."

It was hardly what you'd term an auspicious beginning, but "dis ting" was true and from then on they tried to make the 'Merican operator comfortable in every way. Among the crew were four men who could speak fairly understandable, though somewhat weather-beaten, English, and a fifth claimed, but did not display, knowledge of a few words. The senior operator could speak no English whatever, so my trip held many operating difficulties, as you may well imagine.

We sailed the following morning at eleven. At noon I copied the weather report and took it up to the captain. He looked surprised, then puzzled. "Wat iss dis?" he said.

I told him. "Wedder report?" he repeated, wonderingly. "Dis iss der first ting ob dis kind I hev ever receibed sense dis wireless hass bin on my sheep. It iss nice."

I told him then of my understanding that it was one of the things expected from the wireless and he assured me that it was greatly appreciated and he would be obliged for anything of the kind I might give him in the future. I left the bridge highly elated, feeling in my ignorance of the service that I had accomplished something notable.

En route to Vera Cruz my elation subsided. To-day I would call it an uneventful voyage, but at the time it seemed a most portentous one. Everything, including my impressions of the glories of the seafarer's life, arose within me and left, via the starboard rail, for parts unknown.

But I did not die, as I had hoped. And arriving at Vera Cruz, my solemn resolution to stay ashore forever, abandoning once and for all the position I had worked hard eight months to obtain—all the usual oaths of allegiance to terra firma, in fact, had vanished along with once poignant memories of mal de mer departed.

It was my first trip below the temperate zone and no doubt the initial view of a tropical city atoned for much that might otherwise have appeared of importance. So let it be recorded that certainly not more than nine seconds after the doctors released the ship I went forth blithsomely in search of adventure and a drink.

That the liquid refreshment sought should have been through choice soft, has nothing to do with my reference to familiarity with the temperate zone; it was merely a matter of personal preference, for which of course I can take no special credit. Nevertheless, I needed that drink. I wanted to drown some memories. For what on board was dignified by the name of water had long since lost all resemblance to H^2O, holding not even a haunting remembrance of the accredited water taste, and leaving only hopes that the pleasant fizz and bite of ginger ale could wash away the taste of—well, to be graphic—a motorman's glove.

In my searching, Vera Cruz was polite to me and wished to serve me; this was quite apparent and easily understandable. But as the same could not be said of my Spanish I remained thirsty for quite some time. Finally a cheerful brigand translated my gesticulations with approximate correctness and just as cheerfully short-changed me on the reckoning. This I did not learn until later, when I also learned that it is the national form of welcome to purchasing strangers, no discrimination being made if the article desired is of the earth earthy, or takes the form of ecclesiastical statuettes.

For seven days I continued my Vera Cruzing in solitude, investigating the mysteries of cigar manufacturing, fruit preserving and the shipment of ore, cof-

Progreso, a thoroughly uninviting town where the author contracted malaria

The Cathedral, Mexico City

Bullfight, showing thrust to the hilt

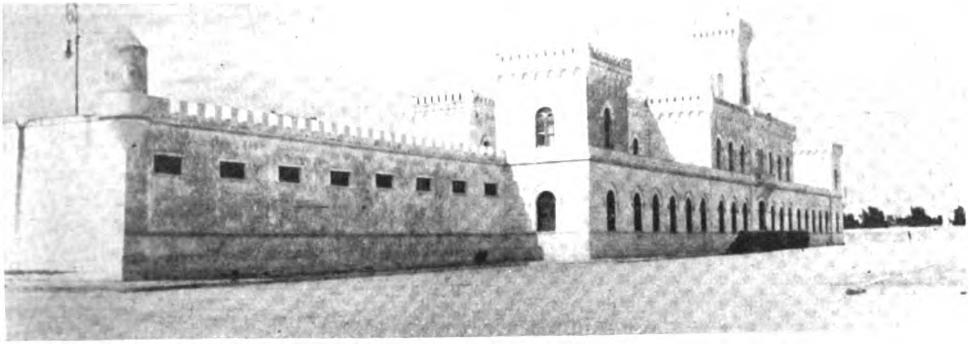
fee, dyewoods and vanilla, with no one to carry on a regular conversation, either on ship or on shore. Consequently I did not know what was going on.

The day before we were due to sail I occupied my usual bench in the Plaza, enjoying the shade and observing with interest the customs of the people. All was peaceful and quiet. The local color considerately displaying its tropical lassitude in form and action, as per the best travelogue specifications, I had given myself over to somewhat philosophical thoughts; it may be even that I dozed.

Suddenly there was a popping of guns. A great commotion arose among the people and through the streets to the south came running a company of soldiers. The bullets were whistling uncomfortably close, and when the soldiers took up a position across the Plaza I moved away rather hurriedly. A number of civilians had the same idea at the same time and we crossed in a group to the Café Diligencias, providentially situated and appropriately named.

From there we watched a sharp little skirmish, lasting about half an hour. The firing was steady and though considerable in volume displayed characteristic Mexican inaccuracy. Nevertheless, I distinctly saw some severely wounded and several fall before the defenders of the Plaza retreated to the northern outskirts of the town.

As I hurried back to the ship I passed three soldiers lying stiff and cold in the again peaceful park, and on the Avenida



The penitentiary at Merida, Yucatan, impressive for its cleanliness

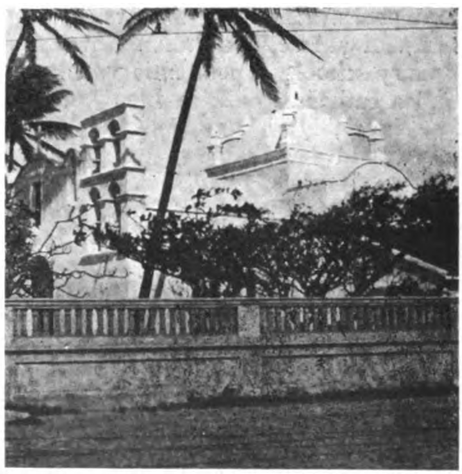
de la Independencia were two others staring upward with sightless eyes.

When I reached the ship she was about to put out into the stream. There were some refugees on board and many others had sought out other ships lying in the harbor. The skirmish, I then learned, was part of the first revolution of Felix Diaz against President Madero. It seems that the fighting had been going on for several days outside the town. Everyone knew about it but me, it appeared; and I realized for the first time how needless, and how dangerous is the shortcoming of the average American, a man of one language.

Vera Cruz in peaceful days

With a cargo consisting mainly of paper pulp we sailed the next morning for Tampico. There we learned that Felix Diaz had been taken prisoner at Vera Cruz through treachery and was imprisoned in the fort San Juan de Ulloa.

Tampico was particularly interesting and the eight-mile trip up the Panuco River afforded continuous opportunity to observe the oil tanks and refineries of one of the largest oil producing ports in the world. As we left the same evening for Galveston I will dispense with further mention of Tampico here, telling more of this Utopia later; for I saw it again under vastly changed conditions.



Church in which a black Christ is worshipped

The voyage ended with a call at New Orleans and our return to Newport News. Leaving the ship at the latter point I journeyed to New York and was immediately assigned to the Ward Line steamship Morro Castle. I remained on

her a year and eight months, during which time I figured in another revolution, one so-called war, was twice held by the Mexican government, twice taken into the United States transport service and was an unwilling participant in a train wreck. These adventures will not figure here in detail, however, as my purpose in this story is merely to give some scattering impressions of Mexico and her people as I found them.

This type of article was done particularly well by J. Terrence Scott under the title "A Year on a Tramp," published in THE WIRELESS AGE for August, 1914. I thoroughly enjoyed that article, my interest being both academic and personal. I have often wondered if Mr. Scott remembers me taking a message from him when he was but two hundred miles south of San Francisco and giving it to Galveston, although we were only just leaving Havana. There was good wireless equipment on the Morro Castle and while on her I worked many long distances.

But returning to my subject: Progreso is the first port of call for Ward Line vessels; it is one of those thoroughly uninviting tropical towns, built on a sand bar and of importance only as the port of entry to the State of Yucatan and as the shipping point for its capital, Merida, twenty-five miles inland. Merida is known as the City of Bells and is impressive in its cleanliness, regularity of street arrangement and fine squares and parks. It has a university, a government palace, a museum, various secondary schools, a penitentiary, a hospital and a cathedral built in 1598. This edifice is richly decorated with gold and silver and I saw many valuable paintings. Merida's forty thousand inhabitants are mainly engaged in the production of sisal grass for export. This is also known as "heniquen" or hemp and is exported principally to the United States.

Just outside Merida lie the two cities Uxmal and Chichan Itza, only recently unburied. There I saw ancient architecture that was very beautiful and bearing close resemblance to the Egyptian ruins. Showing a higher civilization than anything yet discovered on the American continent, the designation "The Egypt of the Western Hemisphere" has been given to Yucatan.

Merida was intensely interesting, but Progreso was not only dull, but unkind. On my first visit there I proved its rumored unhealthfulness by contracting malaria.

Journeying from Progreso to Vera Cruz the wireless stations of the Mexican government at the latter point and at Campeche are in communication with the ships. I had heard favorably of a lady operator being stationed at Campeche, but the endearing terms that may be heard hurtling through the air at all times conjure up a picture of feminine loveliness that is somehow inconsistent with the excellent service maintained by this station.

The snow-capped peak of Orizaba is sighted two or three hours before the vari-colored domes and steeples of Vera Cruz are seen from the dock; the perpetual snow of the volcanic cone seeming strangely out of place as a background for this semi-circular city.

A suggestion of Moorish in the city's architecture accentuates the charm of the Plaza Principal, where the band plays on certain nights and soft-eyed senoritas mingle with gaily bedecked hombres. Here the beginning of ninety per cent. of Vera Cruz courtships are beneath the eye of the beholder. Mexico, interesting by day, is fascinating at night.

Bull-fights are of course a feature of social life. American tourists may hold up their hands in horror at the statement, but I must confess I can now find what at first I thought impossible: real enjoyment in the spectacle. Other features deserving of mention are a church where a black Christ is worshipped and a cemetery holding a quaint tablet dedicated to the memory of the young men who lost their lives fighting against the United States in 1847. Both of which, as the popular Ruggles of fiction fame has it, "would never do with us."

The wireless station is at the southern end of the town and situated in a lonely spot; yet it is comfortable and a hospitable reception with a good smoke and liquid refreshment has always awaited me there.

There is an old joke about a certain American city's chief charm being the train that leaves there. The railroad trip between Vera Cruz and Mexico City is one not soon forgotten. Vera Cruz is interesting, but the capital is wonderful. Furthermore, the actual journey is a revelation along some lines. I have made it many times but I still find it exciting. The distance is about 250 miles and the train climbs from the sea level 7,600 feet to the tableland and through vegetation of every conceivable tropical and temperate variety. Cordoba, the center of the finest coffee-growing district, is the first large town reached. I expect that the coffee exported is undeniably good, but the concoction natively brewed here is, even to a seasoned traveler, undrinkable.

Through tunnels, over trestle bridges, clinging to the steep sides of gorges, twisting and turning so that the brakeman and engine driver can almost shake hands, hanging over a precipice with a sheer drop of 2,000 feet, the tiny train winds its way upward to the shadow of the peak of Orizaba, 17,375 feet above the level of the sea.

At Orizaba women venders of fruits and flowers importune the passengers, and an hour and a half later appear again to effect further sales of the same stock to the same passengers. You learn that they have climbed on foot straight up the mountain while the train has been winding along its circuitous route.

Esperanza, a tiny village but growing rapidly through gold and silver strikes, is next encountered, and beyond is Apam, the center of the pulque industry. Pulque is the famous riot-inciting drink of Mexico, an insidious concoction of fermented juice of the Century plant, in appearance a milky white and sour to the taste.

At San Juan Teotihuacan a glimpse is had of two genuine pagan pyramids, dedicated by the Aztecs to the sun and moon. The largest is one-third as high as the great pyramid of Egypt and both are surrounded by a great area wherein lie vestiges of many tombs.

Continuing then on the tableland, the sacred hill of the Virgin of Guadalupe is passed and pointed out as the saint of the seamen. Snow-topped Popocatepetl gleams in the distance and Iztaccihuatl reflects the legend of the White Woman from a height of 17,550 feet.

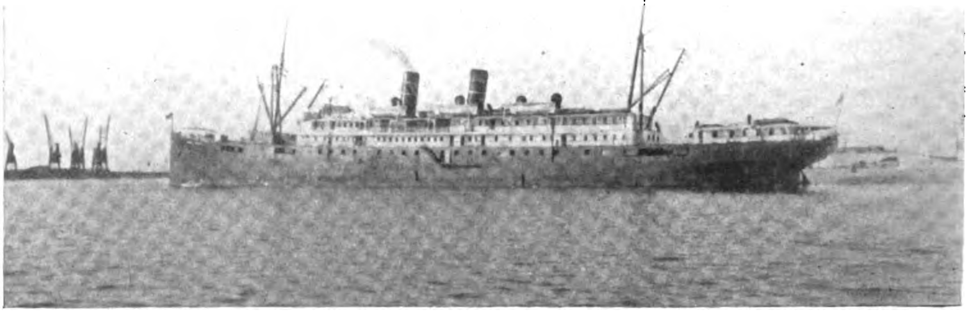
Over the railroad that required thirty years and thirty million dollars to build the train continues on past the Lakes of Tenochtitlan and glides slowly down into the City of Mexico itself.

My first trip I have said was the most exciting, the novelty of teetering on the verge of 2,000 feet drops to destruction seeming almost commonplace in later trips. But in another particular was the initial journey distinctive. Another revolution had started in the night, one that resulted in the overthrow of the president and party in power. Felix Diaz, released from prison by the kindness of Madero, had turned the Federal army from the president and secured its allegiance. With many other followers he had won a good grip on the city. Shells were screaming overhead. The heavy firing was centered on the National Palace, still in the hands of Madero, Diaz's base of operations being the arsenal. All day I watched the bombardment from the house of a Mexican deputado (since shot by order of Huerta) outside the line of fire. Everywhere people were preparing to leave the city and guns were being placed at all points. Before the day closed Madero twice sent an attacking force of 250 men to take the arsenal; both times they were mowed down in droves by the invader's machine guns.

On the second day no street was safe; the firing came from all directions and the houses of all Madero sympathizers were being shelled. Many were destroyed and the offices of the newspapers El Heraldo and Independiente were completely wrecked.

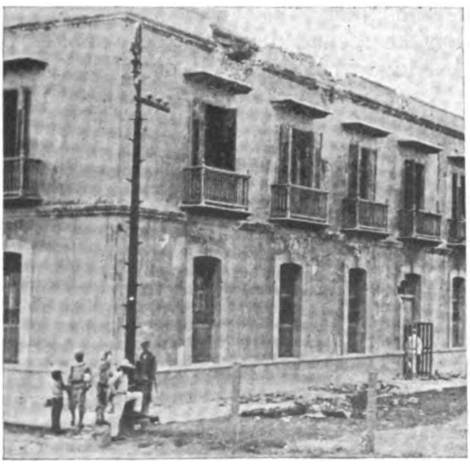
The following day saw a temporary lull in the firing and I took a coach to the station, very glad to leave for Vera Cruz with a trainful of refugees.

When I next saw Mexico City three months had elapsed and most of the buildings had been repaired. This time I made the railroad journey in the night. We were passing through the section of country infested by the Zapatistas



The Morro Castle lying in Vera Cruz harbor at the time when Huerta was chastised

Ruins of the days of Cortez, Antigua



The Naval Academy after the shelling

when the engine driver saw ahead a peon vainly trying to pull two burros off the track. Figuring that it represented a trap, instead of slowing down he speeded up the engine and rode over them. Instantly several shots rang out and a band of outlaws sprang from cover; but by then we were going at full speed and escaped through the rain of bullets with but a few broken windows.

In peaceful days there is a strange fascination about Mexico City. As the saying goes: "He who drinks the water will ever desire to return." The city holds close to a half million residents and certainly more beautiful buildings on the average than any place in the world. Spreading over an area of about twenty square miles, it nestles down in an immense basin-shaped valley embracing perhaps two thousand square miles encircled by high mountains. Beautiful beyond expression is the view of the valley and girdling mountains as seen from Chapultepec Hill, three miles from the city.

The buildings reflect a certain Oriental suggestion along with the influence left by centuries of Spanish domination. Residences seldom rise over two stories in height and have exquisitely planted inner courts. The roofs are terraced and here and there the pinnacled dome of a semi-public building rises and flashes in the sunlight, of which incidentally there is plenty in a climate of eternal spring.

The famous Cathedral, standing on the spot where once stood the great tem-

Taking aboard the Morro Castle 1,083 marines to enforce a salute to our flag

ple of the titular god of the Aztecs, lifts two open towers more than two hundred feet in the air and spreads out to a length of 426 feet. The interior decorations are magnificent, the carved choir alone being valued at a million and a half dollars. Some of the most beautiful decorations in the world are alleged to be included in the National Theatre, still incompleted because of constant revolutionary warfare.

The main streets running from the four points of the compass intersect at the Zocalo, the popular name for the Plaza Mayor, the largest in the city. The Municipal Palace faces the Cathedral on this location, and here too the monotonous National Palace stretches its dismal length. It is said that this park's rare beauty has risen over greater human sacrifice in battle than can be found anywhere in Mexico, and that more blood has been spilled on this ground than on any single spot on the American continent.

From the Zocalo street cars start in every direction, the most modern electric service having been developed for the steadily increasing urban population. Besides the regular passenger service a freight schedule is maintained; and the system even has hearses and mourners' carriages.

San Francisco street, the main business thoroughfare, proved a revelation; it connects the Zocalo with the Alameda and during the late afternoon hours elegantly attired men and women overflow the narrow streets and fill the cost-

Clearing wreckage after bombardment

Our boys occupying Vera Cruz

ly equipages that file slowly along the rows of shops, hotels and clubs.

In the Paseo the socially elect have their avenue, even as business centers along one highway; every Mexican who possesses a vehicle or can hire one seeks this beautiful drive between five and seven in the evening. For two miles to its terminus at Chapultepec the boulevard runs between a double avenue of fine trees, with every quarter mile a circle of flowers and shrubbery or statuary of historic interest. I feel that I can say without reservation, that it is one of the handsomest driveways in the universe.

At Chapultepec Castle, which is now a palace, a military school, a fortress and an observatory, may be obtained the wonderful view of the valley I mentioned before. In the park there is a fine looking wireless station, but I understand it has never done much real work, possibly because it is surrounded by the high mountains.

On the whole, Mexico City is one of the most alluring spots on earth, and one of the most progressive in adopting the many things we call modern. Perhaps this is what makes the eternal pigmy warfare stand out in such sharp contrast. I recall that as I left for Vera Cruz I asked a native which side he was on in the struggle between Huerta and Carranza. He promptly answered: "I do not know—yet; that is, I do not know which side is going to win." This is patriotism as the peon sees it.

Arriving on board on sailing morning, a Vera Cruz detachment of Mexican soldiers followed close behind and demanded that we deliver up Vasquez Gomez, a rebel leader who had been smuggled aboard the ship. The captain allowed the soldiers to search the vessel but the insurgent was not found. After being detained for two days we sailed for Havana and, much to my surprise, Vasquez Gomez turned up urbane and smiling from the secure hiding place he had sought in an effort to join his fellow rebels in the north of Mexico.

A short time after this I encountered a rebel force at close range. On a trip to Jalapa, the capital of the State of Vera Cruz, the train was wrecked and fifty thousand dollars taken from the guards' van. This happened in a mountainous country within which, wherever the land is cultivated, are produced luxuriant crops of bananas, pineapples, oranges, tobacco and coffee.

Jalapa's main distinctions appeared to be hills and rain. There is not a level street in the city and the houses look as if they had been dropped right in among the hills; any resident will praise the place in one breath and in the next guarantee that it will rain ten months out of twelve. On rainy Sundays the band plays in the Municipal Building; this, the Cathedral and the main plaza are the principal points of interest. The main plaza is carefully laid out in flower beds and is reputed to be bewilderingly beautiful in good weather; I cannot verify this statement as during the time of my visit it continued decidedly wet. I will vouch for the band, however, and do not hesitate to say there is no better anywhere in the world. Aside from the facts just mentioned, the only other impression I have of Jalapa is that Americans must be few and far between; I know we attracted no end of attention as we promenaded up and down to the strains of enticing music.

About this time the Carranzistas were surrounding Tampico and pressing the Federal garrison very hard. A general exodus of the inhabitants resulted and the Morro Castle was ordered from Vera Cruz to Tampico to act as transport for the refugees. When we arrived off La Barra, the entrance to the Panuca River, a strong "norther" was blowing and we were told that but an hour before this town had been the scene of a stiff battle which ended in a rebel retreat. Here Admiral Fletcher's Chief of Staff came aboard and I handled many messages between him and the Admiral during the two days we lay there.

It was perhaps two months later that I made a trip to a place called Antigua. With a railway station that was nothing but a tumbled down shack and a river ferry in the shape of an old Indian dugout, the antiquity implied in the name was very much in evidence. To add to the impression, when the river had been crossed I found that the chief

interest of the town lay in some rare old ruins dating back to the year 1519, the time of Cortez. The people here were all Indians and although they showed us the greatest respect, it was mingled with unconcealable wonder. A hotel or restaurant was an unheard of convenience so we arranged with a private family for dinner. The food proved to be a strange series of Indian dishes but, much to our surprise, exceedingly good ones to eat.

Many things interesting to me occurred at various times in the period that followed, but that this narrative may not drag out interminably I will just touch on two later visits to Vera Cruz and one to Tampico.

We were just about to leave Vera Cruz for New York on one of my trips when a Mexican gunboat dropped anchor about two hundred yards away and trained her guns on us. It then developed that we would not be permitted to sail until we had given up eight Mexican Congressmen, deserters from the Huerta administration, and reported to be on board. This was not entirely unexpected because I personally knew one of them, Tomas Pineiro, a deputado for Vera Cruz State, and he had told me on his arrival that he was afraid we would be stopped. Six of the men were found by the authorities and were taken into custody, Pineiro among them. The two others could not be found and it was afterwards said that they hid in the room of Mrs. John Lind, the wife of the American special envoy, while she sat out on deck all night long. As a matter of fact, these two deputados were hidden in the room, but she did not know it, having previously changed to another room and later gone ashore when she learned we would not sail. We spent the night looking down the muzzles of the Zaragosas' guns and all on board breathed a fervent sigh of relief when we were permitted to leave for New York in the early morning.

A short time after this I started on my last trip to Mexico. Huerta would not salute the Stars and Stripes, so, acting as a United States transport, we were ordered to Philadelphia, where we loaded 1,083 marines, large quantities of guns and ammunition, Red Cross supplies and the grim paraphernalia of war. From the League Island Navy Yard, amid cheers of thousands and the tooting countless whistles, we sailed on the momentous voyage which the world watched with bated breath.

The ship was croweded; men and guns were up the rigging, down the holds, everywhere. It was impossible to step out on deck at night without setting foot on a sleeping marine.

At Key West we picked up our convoy and two ominous appearing torpedo boat destroyers stuck close by our side from then until we had steamed slowly through the lines of battleships lying outside Vera Cruz harbor and reached the dock.

The Chester and the Prairie were inside the harbor; between them they fired about 130 three-inch shells into the town. Marines were landed from some of the battleships, under orders to occupy the custom house. They were received with a withering fire which came from all directions, customs officers, policemen and even civilians firing from windows and roofs and from behind the doors of the buildings. A fusillade from the Naval Academy building followed; five hundred Mexican cadets were secreted there. The Chester immediately concentrated her fire and the building was soon in ruins. I understand that every cadet was killed.

There were no Mexican soldiers in the town, Gen. Maas having withdrawn his troops beforehand and entrenched them on the sand dunes back of the city. Twice every day our naval seaplanes would rise and reconnoitre these forces.

Towards the evening of each day, as the firing subsided, I would take a walk ashore and see what further damage had been done. Somehow I always felt secure; perhaps because it never entered my mind that I could be picked off any minute by a civilian sniper. But then there were the changed conditions to observe and I had little thought for anything else. The Vera Cruz which had succumbed to United States authority was a very different town from the one I had known. Buildings were shattered, familiar landmarks were no more, the-

atres were being used as stables and soldiers were everywhere. Nothing seemed natural and it was hard to realize that this was but a tiny sample of warfare as the Powers wage it.

My ship was ordered to lay out in the harbor and wait for refugees and we wireless men had certain hours to stay on watch. On one occasion I heard the pre-arranged distress call, S I S — — — —, from the company guarding the water works. "We are being attacked and want reinforcements," they said, and scarcely a minute later army headquarters replied: "Reinforcements on the way." I give this incident to illustrate one advantage of wireless in war.

Another use of wireless was of great value. The train we were running from the interior was wireless equipped when it was first learned that the wires had been cut, and from this moving train we were told each day how many refugees to expect, long before they arrived.

We lay at Vera Cruz four weeks and then were ordered to Tampico to take on more refugees.

I mentioned earlier in this article that Tampico lies eight miles up the Panuco River, a stream lined with oil tanks and terminals, warehouses, paraffin plants and the agitators of the refineries. When we arrived river steamers and ocean tugs were moving up and down with tank barges in tow and here and there was a chalan, the long poling boat of the Indian, coming often great distances and loaded with vegetables, raw sugar, pineapples, charcoal and chickens. These are sold in Tampico and they return with purchases made in town, the round trip often taking months to make.

I learned that further up the Panuco there were many American farms deserted, fully a thousand acres of bananas were rotting. No gringo, as they call us, was safe. Property of the foreigners was being seized and often wrecked from pure rage. Shells from Federal gunboats had destroyed one huge building; I was told that the ruins I was looking at represented a loss of over half a million dollars.

For me the Indians took on added interest at this time, for I knew that the Indian peon is the only friend of the American in Mexico. The country's population comprises less than a half million whites, less than one in thirty. About one and a half million are of mixed breed; the remaining thirteen millions being Indians. The Indian is absolutely reliable, honest and trustworthy. The half breed, on the other hand, has no virtues and all vices, is an amazing liar, is thoroughly dishonest and ever treacherous. The mobs in Tampico that cried for the slaughter of the gringos were composed of these mixed breeds.

Of the Indian many stories of faithfulness were heard; as an instance, there is this one from the oil fields:

When the Americans were driven from the Topila field one Indian stuck to his post and without instructions continued moving the flowing oil from wells to the tanks and emergency reservoirs. Three times the Mexican Federal soldiers strung him up by the neck in an endeavor to make him join the army. His dogged reply was:

"I don't want to fight. I have trouble with nobody. I don't want trouble. When I first work for gringos I had nothing. I went barefoot; now I wear shoes. I used to work for sixty centavos a day. Now I get four pesos. I have a nice house; I have chairs; I have a talking machine. And once I lived like a dog. No, I will not be a soldier and fight. I want only that you leave me alone." The behavior of the Indians toward the Americans was the one bright spot in these dark times in Mexico.

So that better appreciation may be had of what our good citizens who were fleeing for their lives were leaving behind, I will insert here a word or two about the oil fields of Tampico. In ordinary times a steady procession of ocean tankers come in, load and go out the same day. Some of the crews never set foot on shore during the year, for the larger vessels load at the rate of nine thousand barrels an hour. And for this supply there are wells and refineries that have cost staggering sums of money and produce almost fabulous returns. I know of one well with an eight-inch hole that throws 185,000 barrels a day—

think of it: a year's product at this rate is worth in United States gold coin more than twenty-seven million dollars! The Panuco field alone is estimated to contain oil worth two billion dollars, double the reported fortune of Rockefeller, the oil magnate. And this is but one of three fields.

Picture this industry if you can, and then try to conceive a situation which arose. General Zaragosa and his four thousand Federals had been forced to evacuate Tampico and were caught between two Mexican rebel forces. He retreated across country to the Panuco oil fields and knowing he was beaten sent a message to the rebel General Gonzales that if attacked he would fire the oil wells. The rebels did not attack. But only because if the oil wells were ruined there would be no loot from the gringos.

The situation equals anything an imaginative novelist could conceive. Illiterate men with childlike minds and incapable of self-government—and any one of them could have applied a match to a kerosene saturated wad of cotton waste and started a two billion dollar fire! . . . That is Mexico; a treasure house held by overgrown children.

But this must be my last paragraph; I know I have already exceeded the space allotted to me by a generous editor. It but remains then to say that we took on our refugees, returned to Vera Cruz for more, learned that we were to leave immediately for New Orleans and New York, and turned the vessel's nose north with unbounded joy; for during those last two weeks the thermometer had stood at 110 in the shade. Soon after we arrived home the Morro Castle laid up and I was assigned to another ship. Just now I am running the German blockade in the Great War; but, as a widely quoted traveler maintains, that is another story. Some day I hope to tell it, too.

BORDER CHAIN FOR SIGNAL CORPS

Plans are being developed by the Signal Corps to open a wireless system of telegraph to extend from Galveston, Tex., to the Pacific Coast, along the Mexican border. By such a system the commander of the southern department and the commander of the Second Division in Texas could be kept in constant touch with the troops in the field or along the border. This is made possible by the large tractor aerial outfit now stationed at Fort McIntosh, which has a sending radius of from 200 to 250 miles.

There are also outfits of wireless telegraphy which have a radius of a hundred miles at Galveston, Brownsville, San Antonio and Laredo. It is proposed to supplement these by large field or tractor plants at posts, which will extend the service to the southern Pacific coast. Another tractor outfit is being built and may be sent to Texas or to some post along the border. This will have a four-wheel drive motor car, which will give it greater power in traveling over bad roads.

The use of wireless will be studied by the War College on its annual ride, some time in May or June. This year the War College class will study the Antietam campaign, and a small tractor with a radium of a hundred miles will be assigned to the class.

RAILROAD WIRELESS ABROAD

An interesting example of the use to which wireless telegraphy is being put is provided in an account of the construction of the trans-Australian railroad. It will be necessary to lay the tracks through more than 1,000 feet of unoccupied territory and as a result the question of establishing communication between the workers at the widely separated points in which they will be engaged was at first a troublesome one. The Federal Government was, however, persuaded to establish wireless stations along the proposed route of the railroad.

From and For those who help themselves

Experimenters' Experiences.

The Editor of this department will give preferential attention to contributions from amateurs covering the design of transmitting sets, wave-meters, etc. There is an over-supply of material on receiving tuners, particularly "loose-couplers," the designs for the majority of which present nothing new or original.

FIRST PRIZE, TEN DOLLARS
"Break-Ins"

To the up-to-date wireless amateur who designs his station to carry on communication effectively, the question of the best means to provide for quickly changing his aerial connection from transmitting to receiving and vice versa is of no small importance. A positive and easy "switch-over" is essential in exchanging rapid, uninterrupted messages.

There are two methods in use for making the aerial serve its double purpose, viz., the time honored D.P.D.T. switch, with various refinements and additions, such as extra blades for shorting the detector while sending, etc., and the more convenient and up-to-date "break-in" connection. The advantages of the latter are well recognized, but as ordinarily installed in amateur outfits it is far from perfect.

To those not familiar with this system, a short discussion may not be amiss. A "break-in" connection does away entirely with any form of intercommunication switch, and enables calls to be received from a distant station between signals when sending. In other words, the receiving set is always in a responsive condition the instant the key is released, enabling the distant operator to "break-in" at any point and request a certain part of the communication to be repeated, or to suggest a change of wave-length in order to avoid interference from other stations.

There are two general types of "break-in" systems in common use. The first employs a key, carrying on an insulated extension an additional pair of contacts, which close the ground circuit simultaneously with the closing of the key or preferably just before the ordinary contacts meet and admit current to the transformer primary. The drawing (Fig. 1) will explain the connection more fully. The terminals of the receiving set are connected directly across the break in the ground lead, so that when the transmitting key is open, the primary winding of the receiving transformer is connected to the aerial through the secondary winding of the oscillation transformer. When the key is depressed the receiving instruments are shorted, the antenna circuit completed and the transmitter set in operation. The theory of operation is self-evident, but there are a number of important details to be considered in the construction.

Unless special attention is paid to instrument grouping, the ground wire will be of necessity long and circuitous. This amounts to an unnecessary addition to the transmitting wave-length, which is sometimes highly undesirable in these

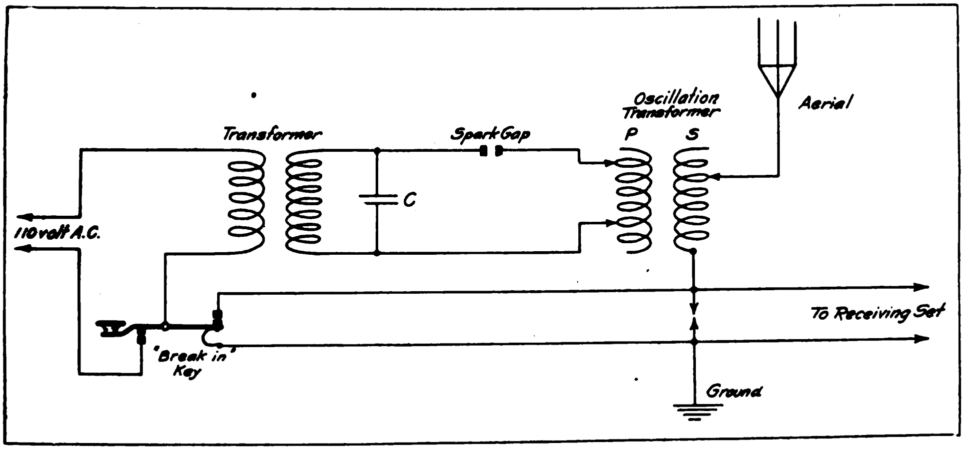


Fig. 1, First Prize Article

days of the wireless law. The remedy is, of course, to locate the key on the table so that the ground lead may be as heavy and direct as possible.

In any case the multi-point key "break-in" necessitates the bringing of the high potential currents of the open or radiating circuit uncomfortably close to the low voltage primary line supply, notwithstanding the fact that the extension arm is insulated. In order to avoid mechanical difficulties, the extension should be as short as possible and the material of which it is composed should be the best hard rubber or any substance of equally good insulating qualities. If this detail is overlooked the result may be a destructive arc into the power line, or at least undesirable leakage with the possibility of personal danger to the operator.

Unless the key is properly designed mechanically, it is very apt to be clumsy and poorly balanced, causing fatigue in operating it. Since the extension must be long enough to secure adequate insulation, and the studs sufficiently large to make a good contact, the key is very apt to be heavy on this end. Accordingly it is a good idea to insert a small spring under the extended portion to obtain snappy action.

One of the secondary pair of contacts should be adjustable vertically. But this refinement alone is not sufficient to overcome the difficulty of adjusting the two pairs of studs so that they both meet squarely and with equal pressure.

Contact A (Fig. 2) can be profitably fitted with a light spring, as shown. This accomplishes two results: it allows the antenna circuit to be closed *first* and makes a firm and positive contact. It also enables the transformer to be de-energized *first* when the key is released, insuring against the flow of current in contacts A and B either when they first touch or separate. The contacts are thus kept free from oxidation by arcing, obviating resistance losses in the antenna circuit, and at the same time precluding the possibility of a portion of the antenna current being diverted into the receiving set. The total elimination of sparking makes possible the use of broad copper or brass studs for the secondary contacts (A and B).

The second type of "break-in" referred to is the connection shown in Fig. 3, employing simply a "needle gap" in the ground lead around which the receiving set is shunted. This method of connection appeared only recently and has found great favor in the amateur wireless field because of its simplicity. In this respect it has an advantage over the multi-point key just described.

In operation, the high voltage antenna current, on account of the frequency of the oscillations, passes easily across the gap in preference to the path through the inductance of the loose coupler primary; when the transmitter operations have ceased the receiving set is immediately in position for receiving signals, the small air gap insulating the aerial from earth.

By this method the antenna circuit is never positively closed. There is always in consequence an energy loss in the form of heat at the "needle gap" when sending. This naturally leads to the question of the construction of the gap itself. Two small rectangular sheets of 1/16-inch brass, each filed to a perfectly straight knife edge and secured to a marble base with means for accurate adjustment, will make a good gap that does not heat excessively. (See Fig. 4.) The air space should be as small as consistent and the sparking uniform all along the edge.

The writer has found, however, that

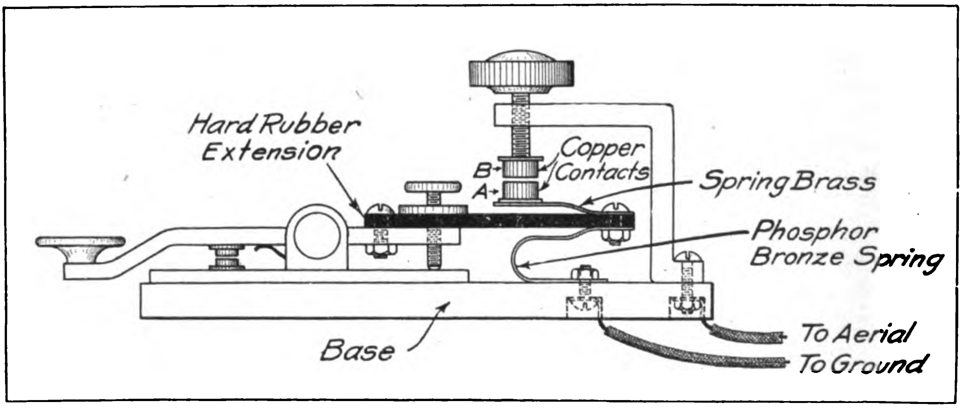


Fig. 2, First Prize Article

this type of "break-in" can only be employed to its best advantage when a vacuum valve detector is used for receiving, because, despite the small size of the air gap, an ordinary crystal detector is invariably knocked "dead" by stray currents during the periods of sending. The detector adjustment might be maintained to some extent by pulling the receiving tuner secondary entirely out of the primary each time before transmitting, but the proper tuning adjustment for the distant station is thus lost, causing more inconvenience than by the use of an old-fashioned "throw-over" switch. The amateurs who use vacuum valves which are not knocked out of adjustment by heavy discharges will no doubt develop the "gap break-in" to the limits of efficiency.

It must not be forgotten that in any "break-in" system the received impulses must pass through the secondary of the helix or oscillation transformer. This necessitates a perfectly clean contact between the clips and the conductor of the sending inductance.

The "break-in" system is no doubt here to stay and the picturesque switch, usually of a size out of all proportion to other portions of the equipment will cease to be a fixture on the amateur's instrument table.

M. K. ZINN, *Indiana*.

Note.—The simple "break-in" method having a small discharge gap in series with the earth as described by the contributor was first developed by Marconi's Wireless Telegraph Co. and has been in commercial use for a number of years.—Technical Editor.

SECOND PRIZE, FIVE DOLLARS
A Rotary Gap Within the Reach of Everyone

Of the many designs of rotary spark gap dischargers presented to the amateur readers in various publications I have never seen one which could be constructed cheaply and easily.

After careful thought on the subject, I hit on the following design which I have found gives excellent results; in fact, the tone produced by my spark gap is among the best in this section, being high and clear, resembling a 500-cycle synchronous spark set.

Referring to Fig. 1, the U-shaped piece of brass which holds the stationary spark electrodes is of ¼-inch square brass rod bent to the dimensions given. After bending 10 equally spaced holes are drilled and tapped, as shown, to receive ten No. 8/32 brass machine screws ⅞ inch in length. These screws are held from turning by a lock-nut.

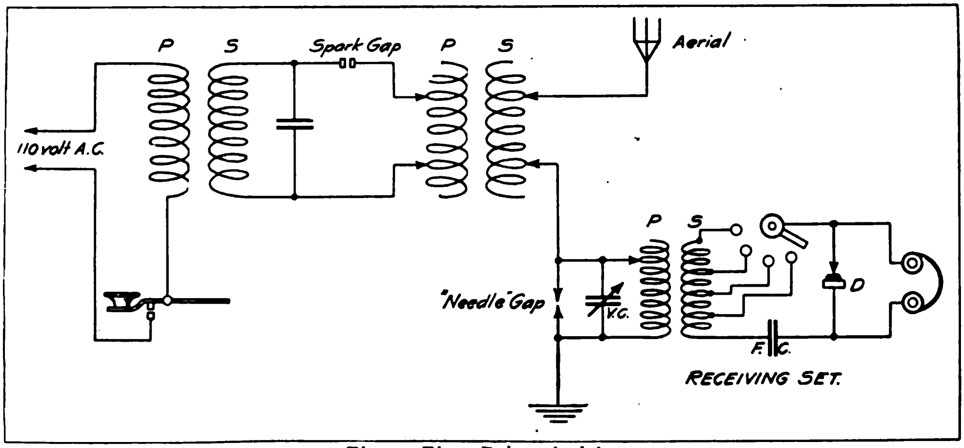


Fig. 3, First Prize Article

Care should be taken that these holes are equally spaced and bored radial so that the inner ends of the screws will be in line and exactly the same distance apart.

The U-shaped piece of brass is mounted on the base with brass angles. These should be heavy enough to prevent vibration of the stationary spark point.

A piece of fibre is turned up to ¾ inch diameter by 1⅜ inches in length and a hole ¾ inch in depth drilled in the center of one end to receive the motor shaft. The fibre is held to the shaft by two 8/32 headless set screws. At a distance of ⅜ inch from the other end, a 3/16 inch hole is drilled at right angles to the line of the shaft. Through this hole is placed a piece of seamless brass tuning 3 inches in length by ⅛ inch and 3/16 inch inside and outside diameter, respectively.

Each end is tapped to receive an 8/32 stud, 1 inch in length, which is held from turning by a lock-nut as indicated. This tubing is held central in the fibre by a set screw in the center of the end. This set screw is put in a tight thread and filed off to a point. The point runs in a piece of carbon held against it by a piece of spring brass. The carbon should be fastened loosely to the spring.

The motor should be fastened to the base at such a height that the shaft is at the center of the semi-circle. Then by adjustment of the screws in the tubing and in the semi-circle, the movable arm should rotate as closely as possible to the stationary electrodes and with exactly the same clearance all the way around for each point.

One connection is made to the semi-circle of brass, and the other to the spring brass brush which holds the carbon. Great care should be taken that the tubing is perfectly balanced in the fibre so that there will be no vibration while running. The motor may be run by a battery or from a source of alternating current giving from 4 to 6 volts.

I use this gap in connection with a ½ k.w. transformer, but for higher powers I suggest that a new set of spark discharge points should be turned, drilled and tapped, and then screwed on the end of the machine screws used in the present design.

It should be remembered that in order to get a high speed from a series motor the load, which in this case is friction, from the wind, should be just as low as possible.

An important feature of this gap is that it works very well with a low voltage transformer since there is but one air gap to be bridged.

Homer R. Seely, *Massachusetts.*

THIRD PRIZE, THREE DOLLARS

A Magnetic Aerial Switch

The average amateur station is apt to be over-stocked with commonplace apparatus and may be deficient in up-to-date labor-saving appliances like those employed at Government and commercial

wireless telegraph stations. One of the most common of these appliances is the magnetic aerial switch for operation by distant control.

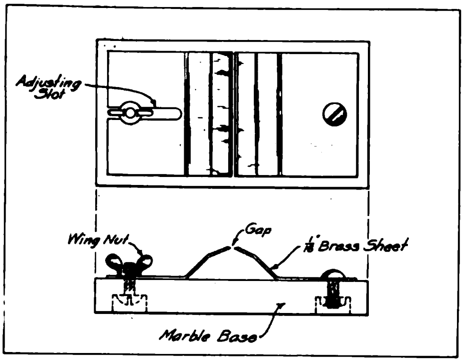


Fig. 4, First Prize Article

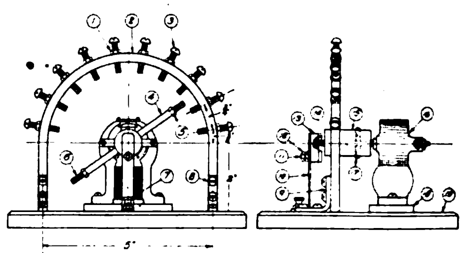
A complete set of drawings for one which I designed is included in Figs. 1 to 9. The dimensions given in these drawings may be altered to meet the requirements of the maker; if possible, however, they should be the same.

The operation of this device will be clearer from an inspection of Figs. 1 to 9, from which it will be understood that when one of the push buttons shown is pressed the aerial switch is thrown to the right, and when the other is pressed the aerial switch is thrown to the left. This is accomplished by a series of five electro-magnets, four of which are stationary and one mounted on a pivot.

A front elevation is shown in Fig. 1, a side elevation in Fig 2, and a rear elevation in Fig 4. The base for the switch is constructed of a ¼-inch piece of fibre or hardwood (the former being preferable) having dimensions of 6 x 10 inches. A hole ⅜ of an inch in diameter is drilled in the exact center for the shaft, and four similar holes are drilled, one in each corner, ½ inch from the edge. These latter holes are intended to take the supporting screws which extend through porcelain knobs into the wall or table on which the switch is to be mounted. Various other holes are drilled for binding posts, etc., as indicated in the drawing.

The vital part of this switch is the operating mechanism, which is attached to the back of the fibre base and is enclosed by a brass or tin case, 6 inches in diameter by 1½ inches deep. This construction also requires five electro-magnets having cores 1½ inches in length, one end of each being drilled and tapped for a fixed 32 machine screw. The core has a diameter of ¼ of an inch and is wound to a depth of ⅜ of an inch with No. 24 D.C.C. copper wire.

The center magnet (the armature magnet) is 2 inches in length and requires no tapping. The field magnets are each supported by an "L" shaped piece of brass having dimensions of ¼ of an inch by ⅛ of an inch, bent as per Fig. 5. These pieces are then attached to the fibre base with wood screws and to the magnets with machine screws. A brass bushing 5/16 of an inch in length by ⅜ of an inch in diameter, also having a 3/16 of an inch hole, is wedged into the hole in the center of the fibre top. This hole is intended to take the shaft which is made from a 3/16 inch rod of brass, 1 inch in length, threaded at one end for a distance of ¼ of an inch. The threaded end is screwed into a copper yoke (Fig. 6) that is sprung over the armature magnet and is secured to the shaft by a lock nut. By reference to

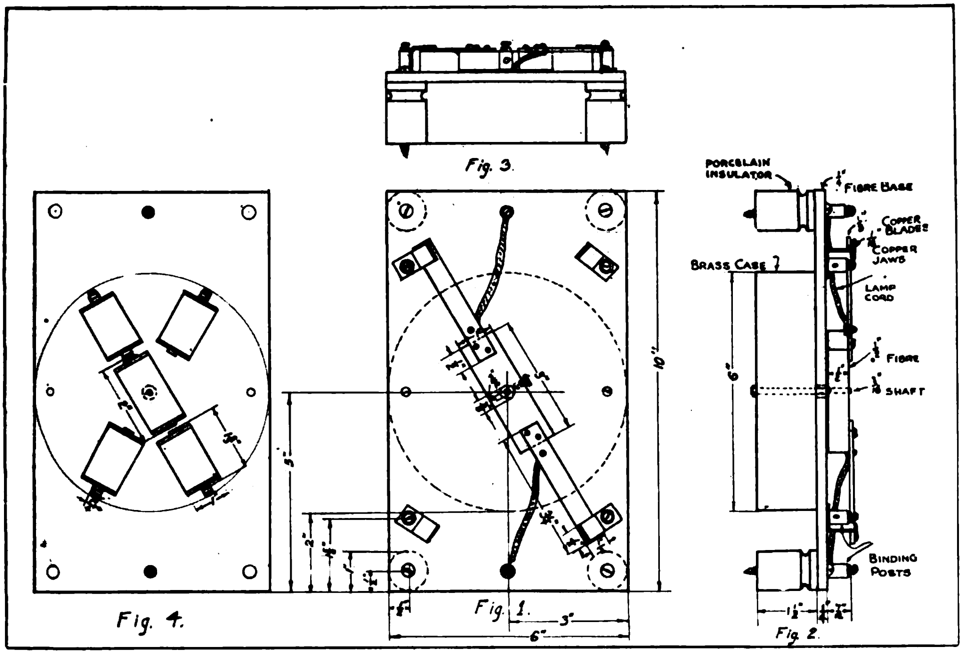


Item No	— Part —	No. parts Req'd	Material
1	Lock Nut #8-32	10	Brass
2	Frame 1/16" sq. bent to shape	1	Brass
3	Mach Screw – 3/8" #8-32	10	Brass
4	Tube 1/8" x 3/16" x 3" long	1	Brass
5	Lock nut #8-32	2	Brass
6	Stud 1" #8-32	2	Brass
7	Binding Posts	2	Brass
8	Mach Screw #8-32	4	Brass
9	Angle	2	Brass
10	Spring	1	Brass
11	Flat Head Mach Screw 1/2" #8-32	1	Brass
12	Lock Nuts #8-32	2	Brass
13	Carbon Block 1/4" x 3/8 x 1/2" long	1	Carbon
14	Set Screw – filed to a point	1	Brass
15	Fibre Cylinder 3/4" x 1 1/8" long	1	Fibre
16	Motor	1	
17	Set Screw #8-32 – Headless	2	Steel
18	Spacing Block	1	Oak
19	Base board 1/2" x 6" x 7" long	1	Oak

Drawing, Second Prize Article

Fig. 7 a clearer idea of the construction shown in Figs 5 and 6 will be obtained.

By referring to Fig. 1 it will be seen that the switch blades are attached to a piece of ½-inch fibre having other dimensions of 1 x 3 inches, which is in turn attached to the shaft by a set screw placed edgewise.



Drawings, Third Prize Article

The blades for the switch are 3¼ inches in length by ½ inch in width, being made from a ⅛-inch bar of copper. Each blade has two small holes in one end for screwing it to the fibre strip, and also another to take a small bolt and nut to which the flexible wires shown in the drawing are attached. Small jaws are required. These are made from 1/16-inch strips bent as shown in Fig. 8. They are then clamped under binding posts to which the switch leads are connected. The switch blades are also connected to other binding posts by means of flexible cords, these being attached, as already mentioned, to a bolt and nut on the blades.

When the field and armature magnets have been so connected that opposite field magnets will attract the armature magnet, the three leads may be brought out in any manner convenient to the builder. These leads are connected to a source of current with two push buttons in series as shown; care being taken that the potential of the source of energy is not too great for the windings of the magnet. The blades on the switch may now be used in any manner suitable to the amateur experimenter and, as generally each has different ideas in this respect, the connections have purposely been left out.

ARNO KLUGE, *Nebraska*.

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE

A Foot-Operated Switch for Amateur Purposes

When the common knife switch or aerial transfer switch is used much valuable time is lost during the receiving period in waiting for the rotary spark gap to stop. A foot-switch constructed after the design shown in the accompanying sketches is very convenient for starting and stopping a rotary gap.

When the foot-switch is employed in this manner, the extra blade on the transfer switch formerly used for the same purpose may now be utilized to short circuit the detector while sending; also the rotary spark gap may be partly stopped before the last "K" is sent.

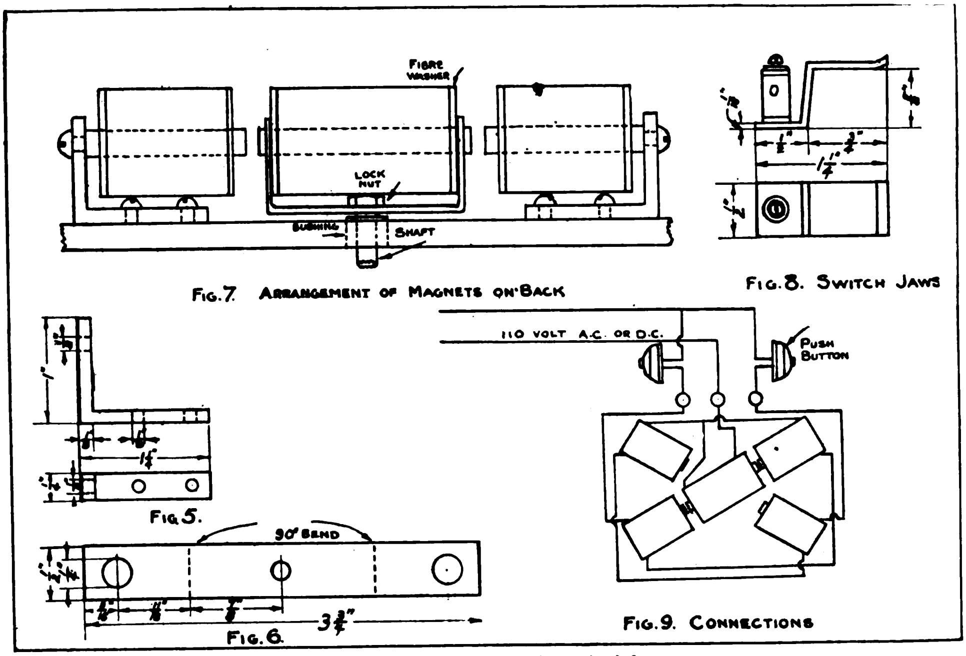
I suggest two types of foot-switches, one where a metal pedal is used, the other in which the pedal is of wood.

An old fan blade serves very nicely for the first named arrangement. These blades are generally of spring brass and are already cut to the correct shape as indicated, Fig. 1a being the top view, and b the side view. A covering of leather

or similar material is required for this type, otherwise the one working it is liable to experience shocks. The diagram given is more or less explanatory.

A foot-switch operated by a wooden pedal is shown in Fig. 2. A metal strip underneath the pedal is here required in order to make the contact. Two strips of spring brass, slightly bent, and fastened at one end only are placed on each side of the connecting strip which is, of course, placed in the center of the pedal. These strips raise the pedal when the foot is removed. A suitable diagram of connections is shown in Fig. 3. A base should be made of either type of switch, having a screw fastened in it for a contact. Binding posts and connections should be made as per the diagram.

John A. Wilson, Jr., *New Jersey.*



Drawings, Third Prize Article

HONORARY MENTION

An Inexpensive Aerial Insulator

I have noticed in articles published several applications of the use of glazed porcelain cleats for insulating purposes in connection with wireless telegraph aerials. I made several trials with insulating cleats as suggested in this article, but generally obtained poor results. If used as shown in Figure 1 I had trouble with the crumbling and breaking of the porcelain and three serious defects developed: (1) they would not stand much stress; (2) they were unsightly; (3) it took a great many of them in series to afford a given amount of insulation (due to the length of the connecting wires).

I now employ these same cleats for insulators with excellent results as shown in Figure 2. They are strong, weatherproof, have a neat appearance and possess fair insulating properties. In explanation of the drawing it should be pointed out that A is a glazed porcelain cleat; B is a brass stove bolt or machine screw, and F is a piece of fibre which has been immersed in boiling paraffin wax to make it weatherproof.

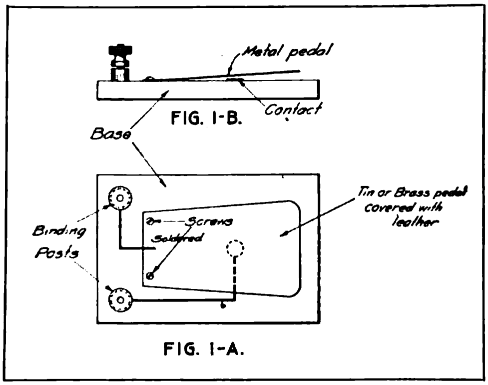
Any number of these insulators may be connected in tandem according to the aerial voltage to be handled.

William H. Scheer, Jr., *Missouri.*

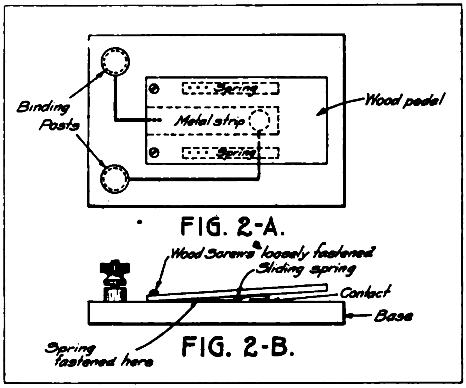
HONORARY MENTION

A Magnetic Aerial Switch

Many amateurs who desire an automatic aerial switch are perhaps not aware that one may be constructed from apparatus which can be found at the average amateur station. The one



Drawings, Fourth Prize Article



Drawings, Fourth Prize Article

I constructed is shown in Figures 1, 2, 3, 4, 5 and 6 and was made principally from the parts of an old telegraph sounder. The switch is operated by a few dry cells, and therefore may be placed at some distance from the apparatus if necessary.

In regard to the assembly of this instrument, the rod (No. 6 shown in Figure 1) should be inserted in the top of the sounder bridge in the threaded hole which formerly held the adjusting screw. No. 5 is an ordinary binding-post, the same as No. 2 (Figure 1). Rod No. 4 is passed through the hole in No. 5 and held tight by lock nuts as shown. Nos. 2 and 2a are the contact holders and are fastened to the fibre strip No. 3. Figure 2 shows a side view of the complete, also the position of the contacts, and the contact spring No. 1 (Figure 2). Figure 3 is a view of the sounder arm, No. 10, showing the position of the contact spring No. 3 and the fibre strip, No. 1.

No. 14 shows the screw which holds the contact spring to the fibre strip, and also serves as a binding screw for the aerial wire. In Figure 4 is shown the method for fastening the fibre strip which holds the contact spring. Figure 5 shows the connection when 10 volts is used; Figure 6 when the battery is used.

In order to use this switch the aerial should be connected to the contact spring, No. 3 (Figure 3); the aerial side of the receiving set to the top of binding-post No. 2 (Figure 1), and one side of the sending set to the lower binding-post, No. 2 (Figure 1).

HOWARD DANNER, *Pennsylvania*

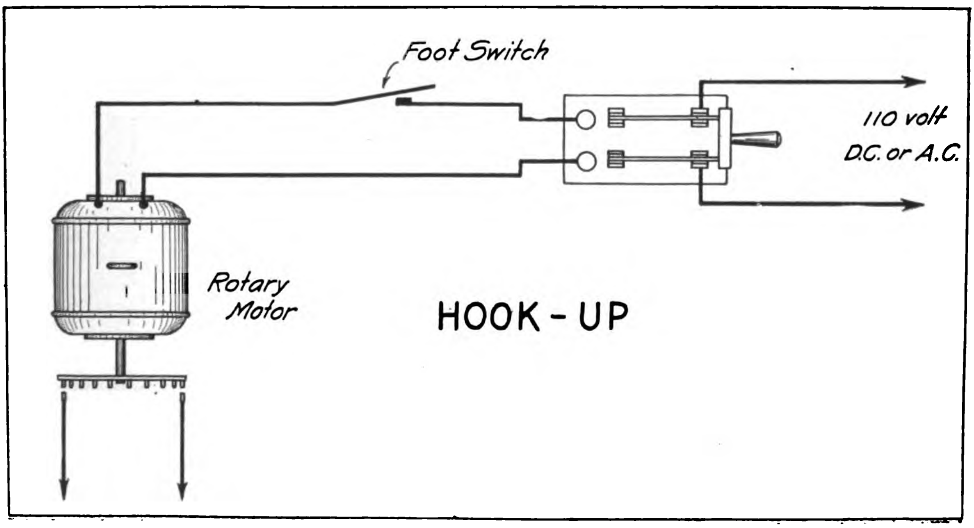


Fig. 3, Fourth Prize Article

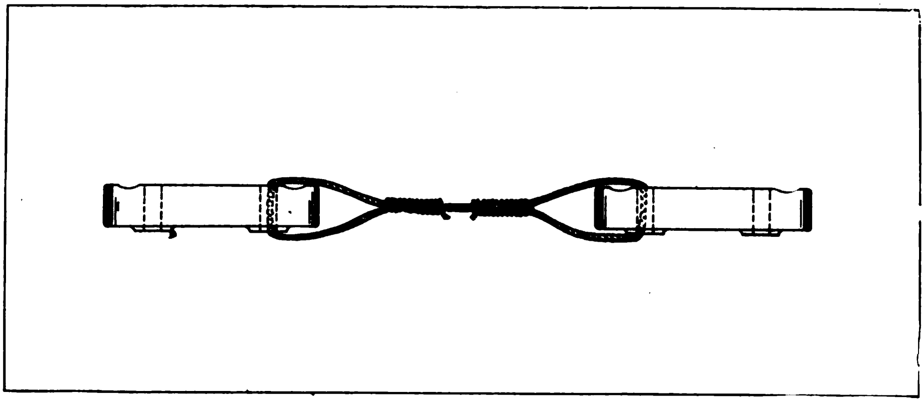


Fig. 1, Honorary Mention Article, William H. Scheer, Jr.

HONORARY MENTION

How to Prevent the Leads from Breaking Away from the Aerial

During the windy and stormy months many amateurs experience trouble with breaking wires in their aerials. Generally the two outside wires of the flat top are the first to give away. I believe this is due to the fact that the lead-ins are usually taken off these outside wires, which are thus subjected to an abnormal strain. This constant twisting and swaying finally break the lead-ins, putting the aerial for the time being out of business. I have experienced the same trouble myself and have used the idea described as follows as a remedy:

Two ordinary cleats or wireless insulators, A and B, are fastened on the under side of the center about two inches from each end, as shown in the diagram. The leads, E and F, are fastened to the cleats and brought down to the station. The wires, C and D, are now connected to E and F by the same size wire as that used in the aerial and leads proper. It can readily be seen that by this arrangement no strain will come upon the two wires, C and D.

Leander L. Hoyt, *California*.

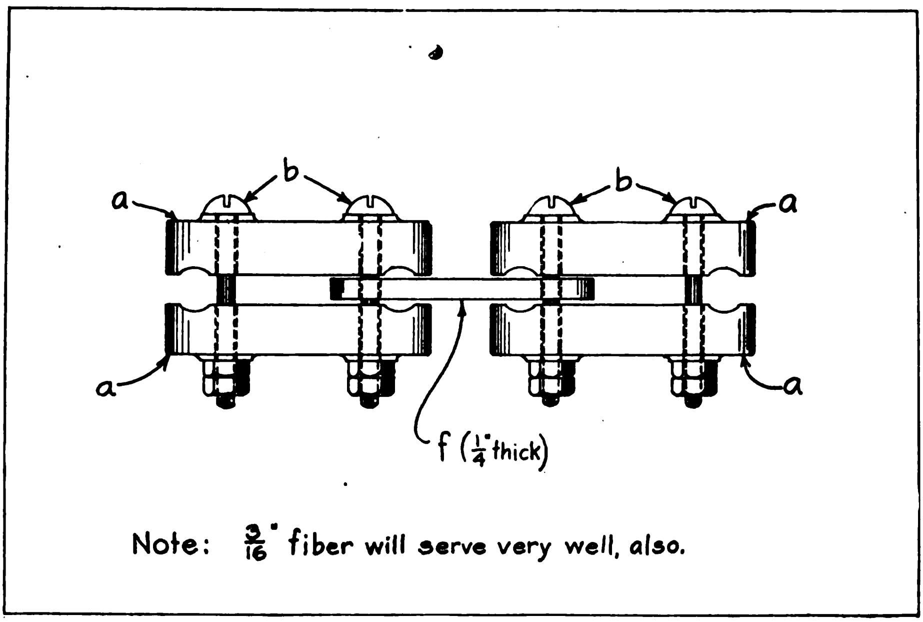


Fig. 2, Honorary Mention Article, William H. Scheer, Jr.

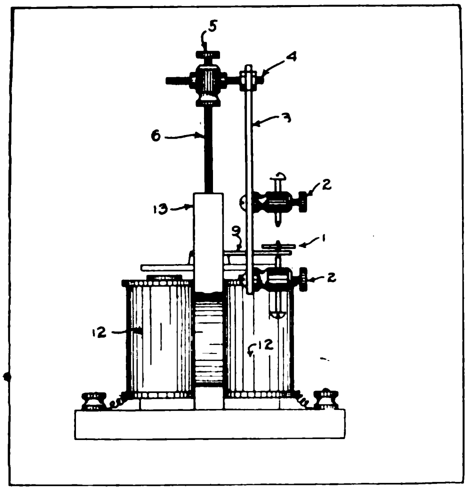


Fig. 1, Honorary Mention Article,
Howard Danner

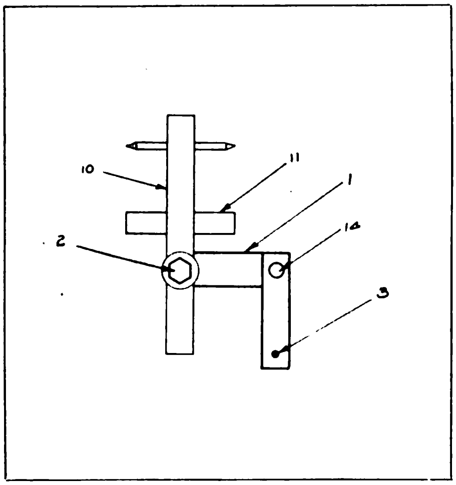


Fig. 3, Honorary Mention Article,
Howard Danner

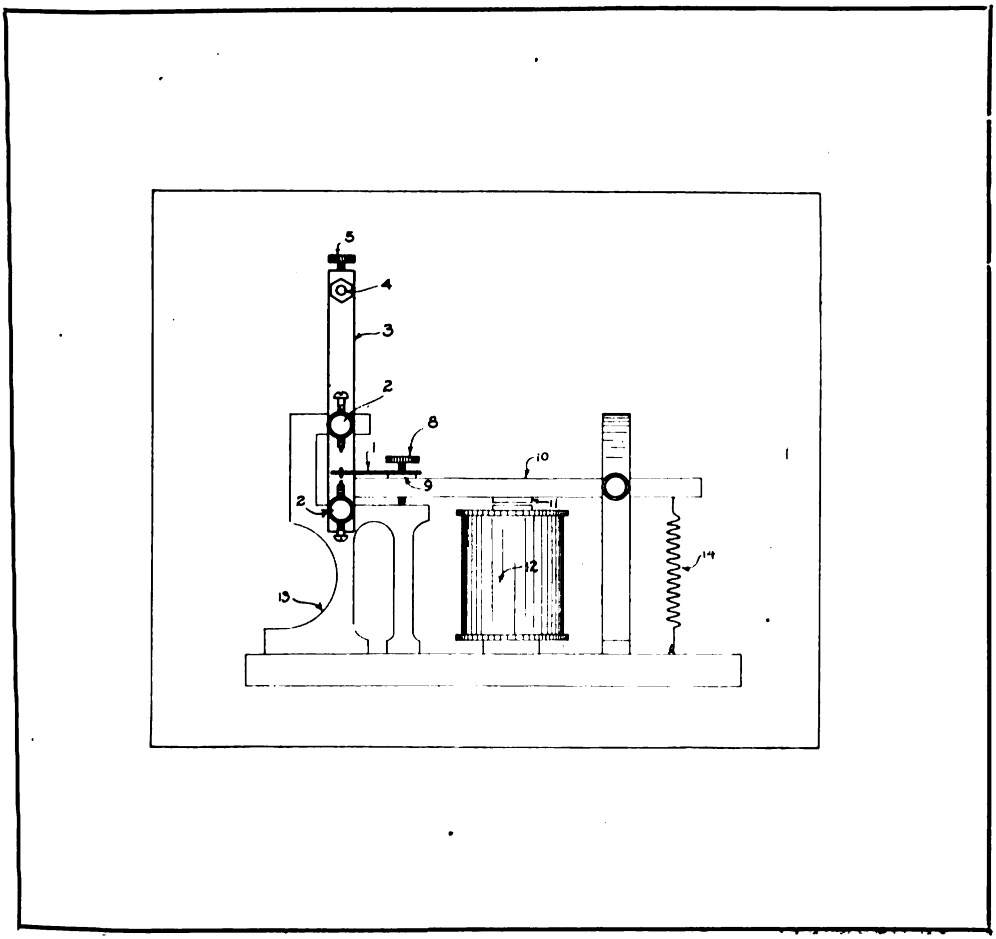


Figure 2, Honorary Mention Article, Howard Danner

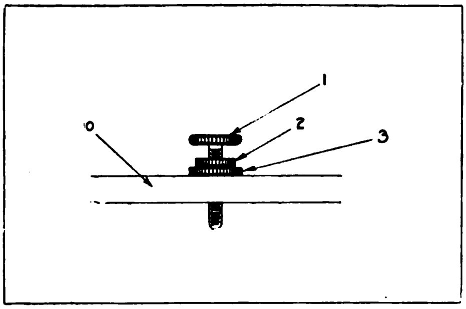


Fig. 4, Honorary Mention Article, Howard Danner

HONORARY MENTION

Keeping the Detector Adjusted

It is customary among wireless telegraphers to shunt their receiving detectors with a switch during the periods of transmission. This is not always an effective method of protection, a better one being to cut the detector from the circuit entirely. This may be accomplished quickly and readily by the use of a well-known switchboard key switch.

A general idea of the switch or the manner in which it is connected to the receiving detector is clearly indicated in Fig. 1. The lever is represented at A. When the knob X is in an upright position the detector circuit is broken. When X is thrown to the right A closes the contacts B and C. This is the receiving position. If desired, the third contact can be utilized, as shown, to place the detector on short circuit as well as out of the circuit. Throwing the lever, X, to the left accomplishes this.

Of course an ordinary D. P. D. T. switch can be used to obtain the same results, but the telephone switch can be mounted in a receiving cabinet and presents a much neater appearance. The switch need not be close to the detector unless the short-circuiting contact is employed.

IRVING FARWELL, *California.*

WIRELESS MONEY SAVERS

As lack of money is one of the principal setbacks to the majority of "radio-bugs," perhaps the following suggestions

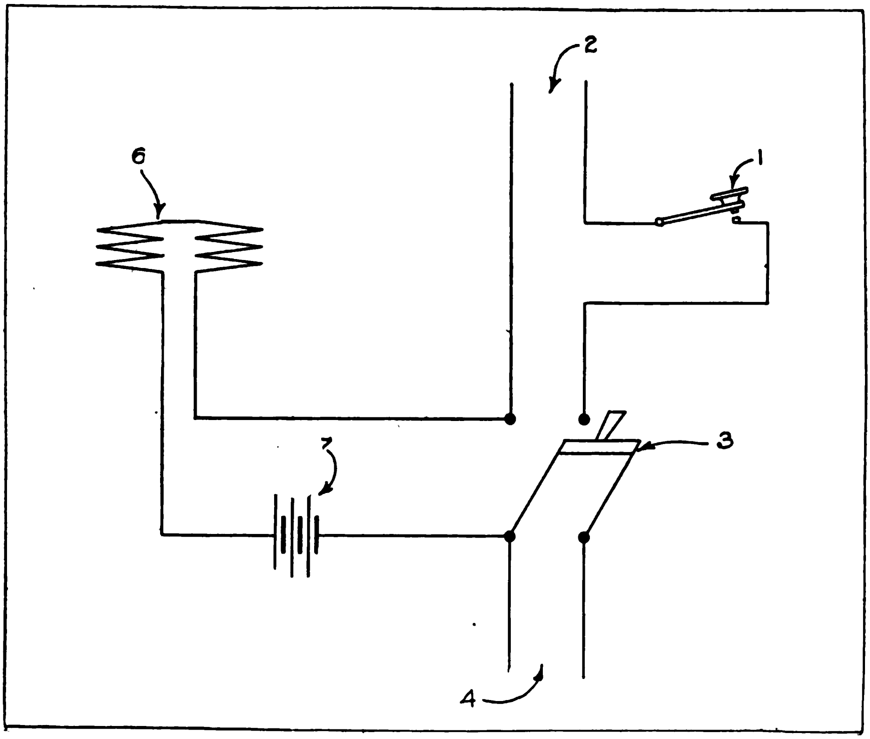


Fig. 5, Honorary Mention Article, Howard Danner

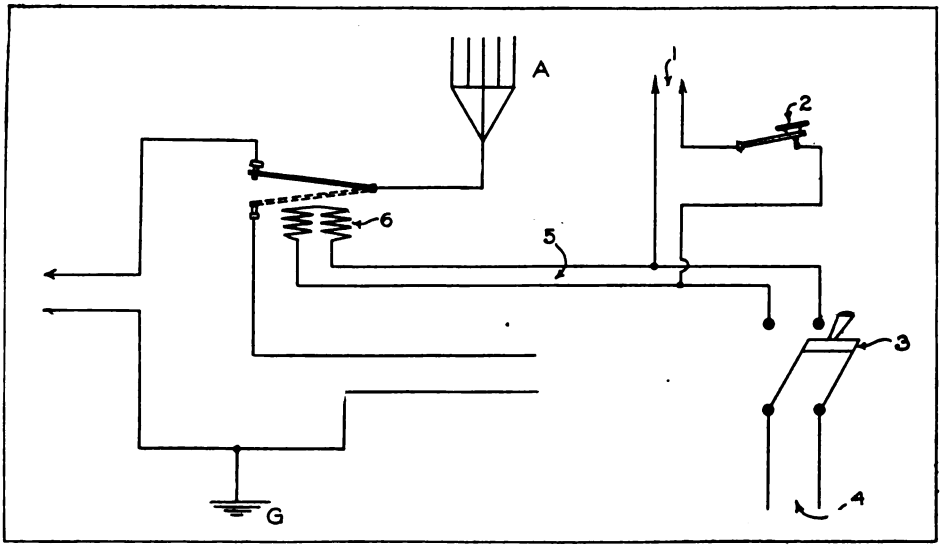


Fig. 6, Honorary Mention Article, Howard Danner

may prove useful to some fellow experimenters:

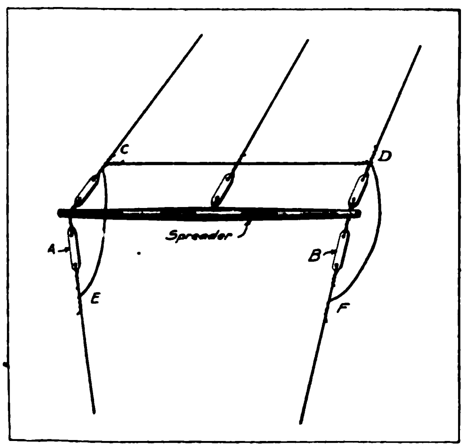
Filister head machine screws about ¾ inch long make ideal contacts if they are ground or filed level with the base of the cut. Hexagonal nuts tapped with the same thread as the screws may be used to connect the wires. The screws cost about seventy cents a gross and the nuts cost about the same.

Roof tins (like those used to fasten tar paper to roofs) and a little ingenuity make excellent heat dissipating fins for the small spark gap.

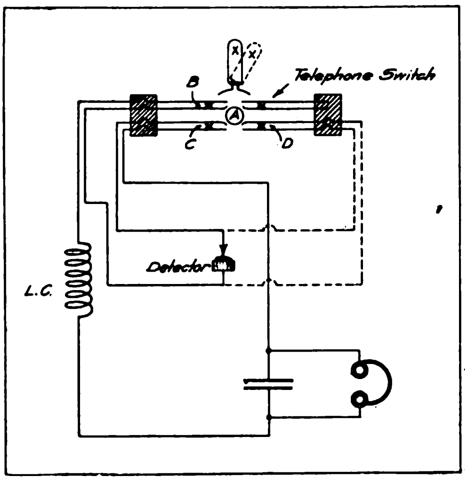
Neat nameplates for wireless instruments may be had when visiting some pleasure resort by investing a few cents in the name plates made on those machines which press names on aluminum strips.

A lightning switch is looked upon as a luxury in most amateur stations. Go to the nearest power house and see if they haven't an old 100 ampere 60-volt S. P. D. T. switch.

I got one this way for less than one dollar.—Karl Edwards.



Drawing, Honorary Mention Article, Leander L. Hoyt



Drawing, Honorary Mention Article, Irving Farwell

With the Amateurs

The second edition of the book listing the stations of The American Radio Relay League has just made its appearance and contains information on approximately six hundred amateur stations. Several stations in the previous edition have been dropped from the list through the owner's neglect to keep in continuous working order, or by reason of absences from home. The losses have been fully covered, however, by the increase in membership.

The League has recently been incorporated and plans have been made to appoint a board of control. An appeal has been made to members for financial support. Handling correspondence has been expensive and most of the money needed has been advanced by the officers personally. The Radio Club of Hartford, which appropriated $50 from its treasury, is mentioned as a supporter which should be paid back. To provide necessary funds a charge designated "station dues" has been decided upon and fifty cents a year will be charged each relay station. Upon receipt of this sum an official appointment certificate will be issued to each remitter and it is earnestly urged that the membership at large will help out with prompt remittances. The new book, a map and message blanks will be forwarded to those who order these at fifty cents additional.

Members who believe they are justified in asking for Special Licenses are advised to communicate with the League headquarters, as special arrangements have been made to expedite these applications.

It is announced that the Radio Club of America is contemplating admitting members from more distant points than New York City and vicinity, from which territory the present membership has been drawn. A paper on the present day activities along the Pacific Coast, prepared by Paul F. Godley, for the May meeting has aroused considerable interest in this organization, one of the oldest amateur clubs in the country.

Ellery W. Stone of the Department of Commerce has consented to address the members of the Inter-City Radio Association at its next meeting in Berkeley, Cal. His subject will be valve receivers, a field in which he has conducted extensive research work.

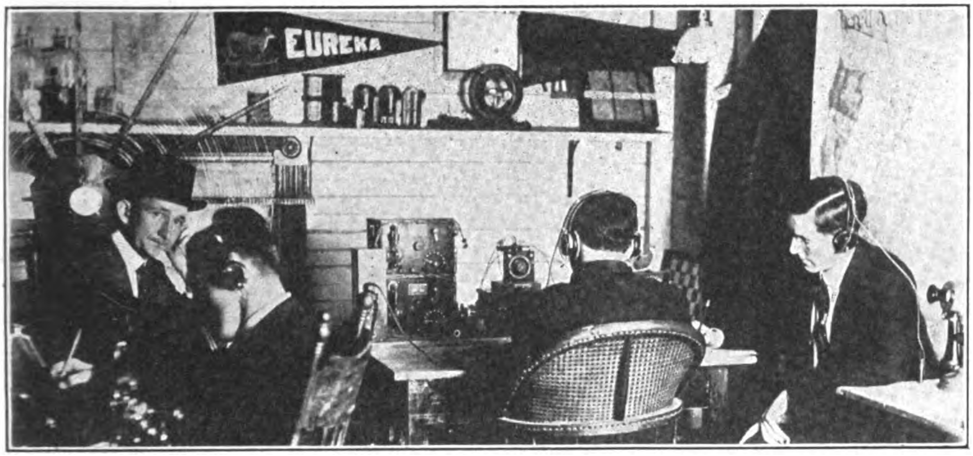
Amateurs residing within the sphere of activities of the Central Radio Association—from the Rockies to the Ohio—are invited to register their stations with Secretary H. B. Williams, Chanute, Kas.

Fifteen members are now on the roster of the Grape Belt Radio Association, organized to secure equipment collectively that would not have been possible individually. A registration fee of twenty-five cents is charged and this includes a copy of the by-laws, a list of members' stations and a certificate of membership. Herbert A. Hiller, of Silver Creek, N. Y., is president.

In Georgia, the Atlanta Radio Club has been formed with the purpose of securing members within a radius of one hundred miles of Atlanta, Ga. Max A. Herzog, 16 Faith street, Atlanta, is secretary.

Two months old, the membership of the Ohio Valley Radio Association has reached a total of sixty amateurs residing in the Ohio Valley. Semimonthly meetings are held in Cincinnati and correspondence may be addressed to that city, 34 East Sixth street.

Many amateurs complain they can-



Station of E. R. Isaak and J. A. Gardner at Eureka, S. D.

not transmit any great distance under the restrictions placed by the Government. Howard C. Seefred and brother Lyndon, radio amateurs of Los Angeles, Cal., claim to have been in communication with Walter B. Ford, an amateur of San Diego, over one hundred miles away. These amateurs were working under 200 meters, both using about ½ k. w. power.

THE INSTITUTE OF RADIO ENGINEERS

One of the most interesting papers presented before the Institute of Radio Engineers was read by Dr. Irving Langmuir on April 7 at a meeting held in Fayerweather Hall, Columbia University, New York. It was entitled "The Pure Electron Discharge and Its Application in Radio Telegraphy and Telephony."

Dr. Langmuir introduced his subject by a careful analysis of the state of the art of manufacturing vacuum tubes when the research work commenced. He showed that in most of the tubes built for commercial work there was a considerable variation under working conditions and that it was very difficult to manufacture tubes in quantity that would have the same characteristics. The work done by several investigators was collated and by means of careful research Dr. Langmuir was able to show that a great many of the peculiarities of these tubes could be traced to a definite source; by continued research on these lines he had been able to overcome most of the difficulties and was able to state that the enormous variation in the tubes used in X-ray and other work was due to the presence of an indeterminate quantity of gas sealed up in the tube. The research showed that the tubes had certain characteristic curves which depended upon the amount of gas present in the vacuum tube and that by eliminating this gas he had been able to produce tubes which had a definite characteristic and which could be made in numbers, each of which would, within limits, have the same characteristic. This was the result of careful work done in evacuating the tube, the lecturer stating that the presence of a small amount of gas made a tremendous difference in the working properties of the tubes.

Having covered the ground thoroughly with regard to the work done by previous investigators and having shown that various results which seemed to be at variance could really be proved to be in harmony with one fundamental idea, Dr. Langmuir went on to state the research that had been necessary to enable this vacuum tube to be used in radio work. He stated that the "absolute vacuum" tube was

called by him "Kenotron" and that this form of tube was not the best for use in radio work. Further investigation had shown that in order to get the best results some amount of gas should be introduced into this vacuum; the name given the tube in which the gas had been introduced was "Pleiotron." The research carried on with a view to radio work showed that the best results were obtained if mercury vapor in definite amount was introduced into the Kenotron. This tube then behaved as a good detector of radio signals and could be used in cascade in amplifying.

The lecturer showed several slides giving the characteristic curve of the Kenotron types of tubes made and then the type of circuit which was most satisfactory for use with the Pleiotrons.

With regard to the Kenotrons he stated that the most useful fact determined about these was that owing to their positive characteristic they could be used in multiple, so that any amount of energy to be handled could be satisfactorily taken care of. By multiplication of tubes he had been able to control the output of the high frequency generator and telephone without wires between Schenectady and Pittsfield, a distance of sixty-five miles. He also stated that with the method of control used on the small units he did not see any reason why, since these tubes could be used in parallel, this method of control could not be adopted for higher powers and thus make it possible to control the output of a comparatively high powered generator by means of a telephone. The amount of power which could be used in one of these units was, in his opinion, capable of being increased and it was felt that the limit for these units had not yet been reached.

Dr. Langmuir stated that for ordinary telephone work over a short distance it had been found practicable to design a small transformer set which, in use with a condenser and the Kenotron, was extremely efficient over the short ranges. This apparatus apparently took up no more space than that required for an ordinary letter basket and any source of A. C. power from Public Service mains could be used to obtain the necessary store of energy required to start this circuit.

In discussing this paper Mr. Alexanderson amplified the information given regarding the use of these Kenotron in conjunction with high frequency circuits.

Dr. Goldsmith called attention to the fact that Dr. Langmuir glossed over the enormous amount of work that had been carried out in this research. He described the various improvements which had been made, leading up to the final improvement whereby it had been found possible to obtain the high degree of vacuum demanded by these tubes. He emphasized that a great deal of credit should be given to Dr. Langmuir and his assistants for the painstaking work and for the enormous amount of time that they had devoted to the research.

Mr. Armstrong in his remarks showed that the curves exhibited by Dr. Langmuir were in accordance with the facts and curves which had been obtained from the gas relay on which he had been working.

PROFESSOR PUPIN ON WAR WIRELESS

Professor Michael I. Pupin, of the Engineering Department of Columbia University, told of the use of wireless telegraphy in the European war at the celebration of the Columbia Alumni Day held in New York City recently. The employment of the art has transformed the method of manoeuvring, he declared. The French system has a central station which covers a large area and communicates with all points of the army. At 4 o'clock each morning the English War Office sends out its messages to the entire fleet within a radius which covers the Atlantic and goes as far as the Red Sea.

A newspaper dispatch from Petrograd says that the news of the European war was conveyed to Vilitsky, an Arctic explorer in Bering Strait, by wireless.

Prins Maurits Lost After S O S

IN the midst of the storm which swept the Atlantic on April 3, the Marconi operator on the Royal Dutch Mail liner Prins Maurits, bound from San Domingo for New York, with forty-nine persons aboard, sent a wireless appeal for aid. The commanders of the craft which received the call made haste to respond notwithstanding the difficulties of navigation in the gale, for the wireless had conveyed the information that the distressed ship was sinking. They searched the ocean about sixty miles northeast of the Cape Hatteras shoals, which had been described as the position of the Prins Maurits, for many hours without success, and it was finally decided that she had gone to the bottom.

The City of Atlanta was beating her way through the storm on the morning of April 3 at twenty-five minutes to nine o'clock when the first calls for aid from the Prins Maurits were sent. Second Operator W. E. Florence was in the wireless cabin at the time, R. G. Mackenzie, the first operator, being at breakfast. Florence immediately asked for a repetition of the message in order to make sure of the distressed vessel's position. He received no reply, however. The news of the plight of the Prins Maurits had also reached the Marconi land stations and Cape Hatteras and Cape May exchanged messages regarding the distress call.

After a while the Prins Maurits sent out a long C Q call, followed by S O S and the position of the vessel. To this were added the words, "Come quick." The captain of the City of Atlanta was then notified of the appeal and the vessel changed her course, heading for the position which had been given.

The distress calls of the Prins Maurits had spread far and wide, several vessels reporting their positions to the Marconi Cape Hatteras station in order to receive directions regarding the rescue work. At first Mackenzie and Florence believed that they were nearest to the Prins Maurits, but a short time afterward the Algonquin reported that she was not far from the ill-starred craft. The latter sent a message at about ten past twelve o'clock noon, this being the last word which those on the City of Atlanta received from the Maurits. She arrrived at the position given by the Dutch liner at half-past three o'clock in the afternoon, but was unable to find any signs of the latter.

The Algonquin of the Clyde Line was bound from San Domingo to New York when Marconi Operator Arthur Bernhardt received the appeal for aid of the Maurits and her position as it was relayed to him by a British cruiser. At this time the Algonquin was about 250 miles off Cape Hatteras. The call said that the Maurits was in distress and sinking rapidly. It urged that aid be dispatched without delay, and Captain Archibald, commander of the Algonquin, immediately steamed for the position in which the Maurits was said to be. For hours the Algonquin cruised about in her search for the Maurits, breasting the destructive seas with considerable difficulty. In fact the rescue ship herself was in danger at one time, for the waves broke over her without cessation, smashing ports, flooding the cabins and galley and carrying away the ventilators. She finally abandoned the search and proceeded to New York.

Among the other vessels which went to the aid of the Prins Maurits besides the City of Atlanta and the Algonquin was the City of Montgomery.

IN THE SERVICE

SHORE-TO-SHIP DIVISION

Norman E. Albee, who is described as the first man born in Delaware to become a wireless operator, was called upon early in life to show his faith in the art. When the first news of the wonders of wireless reached Frankford, where he was born, considerable scepticism was expressed. But Albee did not share the views of the doubting ones and afterward became engaged in the art. He employed his energies to good purpose, too, for he is now manager of the Cape Hatteras Marconi station.

It took a somewhat extended period of time for Albee to determine that he would find his own particular niche in the wireless field. After he had completed his education he was employed for several months as school teacher. He was eighteen years old when he obtained employment with a civil engineer in the mountains of western Pennsylvania where a railroad was being built. His next venture in the working world was taken at Wilmington, where he worked in the Pullman car shops. Three months later found him again in Frankford, absorbed in the study of telegraphy in the railroad station there. He was appointed assistant station agent six months afterward, remaining in that position for a year. During this period he gained considerable knowledge of freight, passenger and express traffic.

Albee had been a tower man on the Long Island Railroad for a year when he definitely decided that his life work was in wireless, his first detail being on an oil barge. He served two years on vessels of the Standard Oil, Old Dominion, Clyde, West India, Savannah and Ward lines. At the end of that time he was appointed manager of the station which the Marconi Company at one time maintained at Wilmington. He was next detailed in charge of tests on the Juniata, which cruised about for ten weeks. Then he was detailed to shore duty at Baltimore where he assigned the operators and checked up the traffic receipts on vessels leaving the city. He was manager of the Marconi station at Norfolk for nearly a year, remaining there until it was closed and the staff had been transferred to the Virginia Beach station. He was also manager of the Tampa station for eight months. He was appointed manager of the Cape Hatteras station two years ago.

The Cape Hatteras station is located on an island about forty miles in length and has an average width of less than two miles. The nearest mainland lies thirty-five miles across Pamlico Sound in North Carolina, but the mail, merchandise and travelers are conveyed to the station from Elizabeth City, N. C., one hundred miles away. The means of transportation are provided in small launches or sailboats, one or two days being taken in making the trip from one point to the other. The station is located among the hills about a quarter of a mile from the water. It has transmitted messages to the most northern points in the United States as well as to the remote tropical waters of South America, and has been active frequently in aiding vessels which flashed the S O S.

Marconi Men

The Gossip of the Divisions

Eastern Division

R. G. Cuthbert is now on the City of Montgomery as senior. George Abbott, who spent about a year on the Maracaibo running to the tropics, has been assigned as junior.

A. E. Hapeman and C. Heinline are now senior and junior, respectively, on the Maracaibo.

Operator Reachard of the Dacia has been detailed on the newly-equipped Security. The Dacia, after a daring attempt to get through the Allies' blockade, was captured by a French cruiser and taken to Brest. Reachard did excellent work on the Dacia, communicating with land direct when 2,000 miles out.

R. J. Green has been assigned to the Saratoga as junior, relieving R. R. Robb, who goes to the Antilles as junior.

O. M. Shaw has been transferred to the Comus. I. T. Carpenter is junior on this ship.

M. O. Smith, who returned from the Pacific coast several months ago, has succeeded Shaw as senior on the Caracas.

J. F. Hughes is now attached to the Pacific Coast Division, having been appointed to the Georgian when that vessel was lying at New York recently.

A. Cruttenden has been promoted to senior of the St. Louis of the American Line. J. Edward Jones is junior.

S. J. Ellis, who recently returned to New York after having made a trip on the City of Delhi, a British vessel, to Port Said, has been assigned to the Burmese Prince.

William Miller of Obidense fame is now on the Gulfoil.

The S. Y. Zara is laid up. Operator Williams has been removed from her and assigned as junior on the St. Paul.

W. S. Scott is now on the Honolulan of the Pacific Coast Division.

Joseph Grosser, recently graduated from the Marconi School of Instruction, has been assigned to the barge Chenango, relieving D. H. Fultz, who has resigned from the service.

Henry Markoe succeeds M. O. Smith as senior on the Parima.

B. T. Elkins, recently graduated from the Marconi School of Instruction, has been assigned to the Northland, relieving H. S. Van Cott, who is now second on the Camaguey.

A. Bald and J. A. Drohan have been assigned as first and second respectively, to the Mayaro. Drohan has just entered our service. He was the second operator on the Columbian, when she was burned in midocean in the summer of last year. On that occasion Drohan and several of his ship mates were tossed about in a small boat for several days before being rescued.

H. McDonald is one of several men taken from the Marconi School of Instruction during the last few weeks and given assignments. McDonald is junior on the Arapahoe.

Harold Mack has been relieved on the Texas by John Tomlinson of the Southern Division. Mack is now on the British steamship Walton Hall, making a voyage to South Africa.

A. J. Falke, assistant operator on the El Cid, has been dismissed from the service for disobedience. K. M. Hance, formerly of the Great Lakes Division. takes his place on the El Cid.

V. H. Rand, recently of the Marconi School of Instruction, has been assigned to the El Sol as junior.

M. Beckerman and W. S. Wilson have been removed from the Northland. J. W. Harte and C. Preiss succeed them as senior and junior, respectively, Beckerman taking Harte's former post as senior on the Northland.

Frank Mayer, a new man, has been assigned to the Princess Anne as second.

J. A. Johnston has relieved R. Duna on the Alabama. Duna is on leave of absence because of illness. Johnston was formerly in the service of the Gulf Division.

H. F. Ward, a graduate of the school, has been temporarily assigned to the Stephen, a British vessel, for a voyage to Barbados.

R. J. Kingsley, formerly of the El Siglo, is now on the Medina, a one-man ship.

G. I. Gerson has been assigned to the Santa Cruz of the Pacific Coast Division.

R. H. Fleming and H. A. Lemkie have exchanged ship details. Fleming is now on the El Rio as second and Lemkie is on the El Oriente as second.

W. W. Rich, who took the S. Y. California to San Francisco, returned by rail to New York after the yacht laid up on the Pacific Coast. Rich says he enjoyed the voyage, although several severe storms were encountered on the Atlantic coast.

W. E. Bisgrove, who was temporarily assigned to the Shenandoah, returned to New York on that vessel.

W. V. Moore has been assigned to the S. Y. Alberta.

C. L. Fagan and A. J. Minners have exchanged ship details, Fagan being assigned to the City of Savannah and Minners to the City of Columbus.

L. R. Schmitt and W. F. Dillon have been removed from the Evangeline, the vessel having laid up.

E. N. Pickerill and H. Orben, senior and junior, respectively, of the Kroonland, have been detached from that vessel. The Kroonland will shortly go into the Panama-Pacific service and is to be laid up for dry docking. She has just returned from an eighty-day trip around South America, during which she stopped at every large port on both coasts.

W. J. Sweet has relieved W. E. Florence as junior on the City of Atlanta.

A. W. Mayer and W. E. Florence are now on the North Star as first and second operators. The North Star has resumed her old run between New York and Portland.

A. Steeves, a new man, has been assigned as second to the Calvin Austin.

Southern Division

C. H. Warner has been transferred from the Essex to the Dorchester as senior operator, vice J. L. Brannan.

E. P. Hough was assigned to the United States Collier Ulysses for the trial trip off the Delaware Capes, from April 4th to 15th. The Ulysses was built at the Maryland Steel Company's Shipyard, at Sparrows Point, Md., for the Panama Canal service.

J. H. McCauley, who recently made several trips to Bordeaux, France, and ports in Italy, has returned to the Southern Division. McCauley has been assigned to the Parthian as senior operator in place of L. H. Gilpin.

W. J. Phillips has returned to the Southern Division after an interesting trip to Genoa, Italy via Buenos Ayres, South America. He was assigned to the Cretan as senior operator, vice, D. Levin.

L. H. Gilpin has been assigned to the Cretan as junior operator, relieving J. F. Larrimore.

Junior Operator J. E. Bell has been transferred from the Howard to the Parthian relieving J. F. Furst.

F. F. Reb, formerly senior operator of the Parthian, has been transferred to the Gulf Division.

M. C. Morris, Marconi engineer, is at present equipping the William O'Brien and the Gulfcoast at Philadelphia with ½ k. w. panel sets.

Until recently the San Juan had a second operator who was called to the bridge early one morning to use the Morse light while passing Sand Key lighthouse. Evidently he had not heard the captain tell him to signal the San Juan's passage, so he called "C Q, who abeam S. S. San Juan, where bound?" etc. The keeper at Sand Key is evidently of a humorous turn of mind; he came back with "We are anchored OM, we haven't moved in years."

S. Cissenfeld, assistant operator at the Baltimore station, has been assigned to the Northern Pacific as senior operator. G. W. Kelley of the Persian, has been assigned as junior operator. The Northern Pacific is a sister ship to the Great Northern, being of 27,000 tons, and equipped with a 2 k. w., 500-cycle set, and a ½ k. w., 120-cycle panel set as an auxiliary. Both the Great Northern and Northern Pa-

cific will ply between San Francisco and Portland, Ore., via Astoria.

Great Lakes Division

The Harvester went into commission April 14th. Operator E. G. Streigel is in charge.

Operator C. Short has been transferred from the Lake Michigan District to the Gulf Division.

Operator A. F. Moranty, Jr., has been assigned to the Lakewood.

Operator F. Marshall has been assigned to the Lakeland.

Operator C. W. Thomas has been assigned to the Lakeport.

Operator E. L. Nelson has again been assigned as manager of the Calumet, Mich., station.

Operator J. H. Hankin has again been assigned as manager of the Buffalo, N. Y., station.

Operator Joseph Newton has been assigned to car ferry Ashtabula as operator and purser.

Car Ferry M. & B. No. 2 went into commission March 16th. Operator H. W. Walters was placed in charge as operator and purser.

Collier M. & B. No. 1 went into commission March 16th. Operator R. C. Hough was placed in charge.

Operator George Keefe, on the Iowa when she sank February 4th, has been placed in charge of the Georgia.

Operator H. M. Junker has been placed in charge of the Alabama.

Operator J. E. McDonald has been placed in charge of the Arizona.

Operator H. F. Neiheisel has been transferred from the Georgia to the Carolina.

Operator C. R. Barker resumed his duties as night operator of the Cleveland, Ohio, station on March 16th, when the station resumed operations.

Pacific Coast Division

N. D. Talbot has been assigned to the Adeline Smith.

K. Peterson joined the Asuncion at Eureka, March 26th, vice E. R. Fairly.

L. W. Sturdevant left San Francisco on April 8th aboard the sailing vessel Star-of-Alaska for Chignik, where he will be stationed during the summer.

C. A. R. Lindh, formerly connected with the Mutual Telephone Company, Ltd., of the Hawaiian Islands, left San Francisco, April 9th, on the Tacoma to fill in for the Alaska Packers in emergency cases.

Sig Gaskey, who has been on the tug Kadiak since April 10th, will be stationed at Nak Nek for the A. P. A.

W. J. Erich and P. M. Proudfoot are scheduled for positions with the A. P. A. and expect to leave here about April 29th.

I. W. Hubbard has been appointed assistant on the Aroline.

R. Camp joined the Beaver as assistant on April 10th.

H. Grundell was assigned as operator in charge of the Cabrillo on a recent excursion trip.

T. Lambert was transferred to the Nann Smith as assistant on April 1st.

H. C. Hax, formerly operator in charge of the Great Northern, is now acting assistant aboard the Congress.

W. R. Lindsay and B. Farrington are acting as first and assistant respectively aboard the Celilo.

F. Harper and J. C. Mitchell recently departed on the City of Para, bound for Panama, as chief and assistant.

A. E. Werner was recently assigned to the J. A. Chanslor.

K. E. Soderstrom is now in charge of the Col. E. L. Drake, vice P. C. Millard, resigned.

F. Mousley recently joined the Francis Hanify.

J. F. Hughes was recently assigned to the Georgian at New York, relieving R. E. Smiley, resigned.

H. Hatton was temporarily assigned to the Governor, March 20th.

M. H. Mears, assistant on the George W. Elder, was relieved on April 6th by Operator H. Oxsen. Mr. Mears will remain at his home in Coos Bay for the present on account of ill-health.

W. S. Scott, a former member of this division, relieved Assistant Operator A. F. Pendleton aboard the Steamer Honolulan at New York on March 24th.

J. Echlin was temporarily assigned to the tug Iaqua on March 27th, returning April 4th. The disabled steamer O. M. Clark, to the assistance of which the tug

was dispatched, has arrived safely at San Diego.

B. C. Springer was temporarily assigned to the Lurline as assistant on March 29th.

P. S. Finnell joined the Mongolia as assistant on March 23rd, B. McLean acting as chief. The Mongolia, with McLean and Howard, holds the trans-Pacific record of 1,504 newspapers sold.

T. D. Bryant, of the Hillcrest station, is now on the Manoa plying between San Francisco and Honolulu.

L. E. Grogan, formerly of the Construction Department, is now on the new Standard Oil steamer J. A. Moffett.

A. E. Evans recently relieved P. E. Weymouth as operator in charge of the Norwood.

H. Dickow was recently placed in charge aboard the Newport.

S. Cissenfeld and G. W. Kelley have been assigned as chief and assistant on the Northern Pacific.

W. Ruddock and E. Livesey left on the Persia for the Orient as chief and assistant respectively, April 10th.

F. M. Roy and W. J. Manahan left for Seattle on the President, April 10th. Manahan will be relieved in Seattle by the regular assistant, B. H. Linden.

W. G. Ludgate, of the Willamette, was transferred to the W. S. Porter on March 25th. Ludgate has to his credit eighteen months of good work aboard the Willamette.

A. Konigstein of the General Y. Pesquiera is spending a few days at Los Angeles.

A. M. Quasdorf, third trick man at the KPH (Hillcrest) station, was married to Miss Aileen R. Wienboldt at the residence of the Rev. Powers on April 5th at half-past seven o'clock in the evening.

T. J. Welch has joined the San Juan as operator in charge.

A. Pattison was assigned to the Henry T. Scott on April 7th.

F. Wiese and K. D. Noble left recently on the Willamette as first and assistant respectively.

Seattle Staff Changes

H. F. Wiehr, who has been detailed on the tug Wallula, is now first operator on the S. S. Paraiso.

P. M. Jacobson has been transferred from the fishing schooner Zapora to the Wallula.

J. F. Hammill made one round trip on the Pavlof as second and resigned, being relieved by G. W. Woodbury, late of the Dora.

A. G. Simson, after completing a round trip on the Spokane, has been transferred to the Admiral Evans as second.

A. Boots, who has been detailed on the Chicago, has been appointed first on the Spokane, H. W. Barker making the trip with him as second operator.

W. J. Manahan, of the Seattle Construction Department, has gone to San Francisco on a short vacation. He has been relieved in the Engineering Department by H. W. Barker.

A. E. Marr, second on the Admiral Evans, has been detailed to take charge of the bark Berlin which is scheduled to sail in a few days for the Northern cannery.

J. E. Johnson, first operator of the Admiral Evans, and O. Treadway of the Queen have exchanged ship details.

J. A. Sterling of the Y. M. C. A. School has been assigned as assistant on the Admiral Evans.

A. A. Isbell, superintendent of construction, having completed the Ketchikan semi-high-power station, is now conducting tests at Juneau. Active construction of the new 10 k. w. plant at Juneau will begin immediately.

The 25-k. w. station at Astoria is rapidly nearing completion and the first link in the Alaskan system is expected to be in working order not later than May 1.

Roy Wood, second operator and freight clerk of the Despatch, was married during his last visit in port to Miss Jefferies, of Friday Harbor.

R. F. Harvey, formerly second operator on the Admiral Farragut, made a round trip on the Admiral Evans and has now been appointed first operator on the City of Seattle.

E. C. Nelson, of the Admiral Farragut, has resigned.

H. L. Edling of the Paraiso, has resigned.

Vessels Equipped With Marconi Apparatus Since the April Issue

Names	Owners	Call Letters
Parisian	Leyland Line	MCR
Nicosian	Leyland Line	MCG
Wyvisbrook	Brook Steamship Co.	MCT
Nakomis	H. E. Dodge	
Jim Butler	Compagnie Du Boleo	WIL
Wapama	Charles R. McCormick	
Gulfcoast	Gulf Refining Co.	KUE
Southerner	Walker, Armstrong & Co.	KJF
Sultana	Mrs. Mary W. Harriman	KZH

THE HANDLING OF OFFICIAL RADIOGRAMS

The Superintendent, U. S. Naval Radio Service, under date of April 5, requests publication of the following information:

When radiograms from ships other than naval vessels relating to official business of the United States (those having the word "Govt." preceding the address) are forwarded through Naval radio shore stations, they will be transferred to forwarding lines without any further attempt to relay. These "Govt." messages include those addressed to the Weather Bureau or Observer.

In the case of all "Govt." messages originating on ships, Government or otherwise, in Alaskan waters, forwarded through Naval radio shore stations, destined to points in the United States, they will be relayed by Navy radio to North Head if for points outside of California, or to Eureka if for points in California, and there transferred to forwarding lines. The preceding applies where no routing instructions are given, but messages will be routed otherwise if so directed by the station of origin.

No charge will be made by the Naval Radio Service for the transmission of these "Govt." messages, but it will in *all* cases look to the station of origin for all forwarding charges at Government rates.

LAG IN NAVAL TIME SIGNALS

The U. S. Naval Observatory has determined the lag of the Arlington signal to be about eight hundredths of a second (.08) and that of the Key West signal to be about thirty-three hundredths of a second (.33), this lag being due to the various relays in the telegraph lines over which the signal passes from the Naval Observatory. The error of the time signal is generally less than one-tenth of a second (.1).

INSTITUTE OF ELECTRICAL ENGINEERS MEETING

"Continuous Waves in Long-Distance Radio Telegraphy" was the title of a paper read by L. F. Fuller at the meeting of the American Institute of Electrical Engineers held in New York on April 9. Mr. Fuller said that the ability to predetermine the probable normal daylight sending radius of high-powered wireless stations is of prime importance in their design. The final conclusions drawn from a comparison of empirical transmission, formulated for continuous and damped waves, are that the transmission efficiency of continuous waves is somewhat higher than that of damped waves on wave-lengths of approximately 3,000 meters or above.

SERVICE ITEMS

George S. De Sousa, traffic manager of the Marconi Wireless Telegraph Company of America, has returned to New York after a trip to Chicago, Cleveland, Detroit and other cities in the Great Lakes Division of the Marconi Company.

* * *

F. M. Sammis, chief engineer of the Marconi Wireless Telegraph Company of America, is on a tour of inspection of the stations in the Northern District.

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MARCONI WIRELESS TELEGRAPH COMPANY

OF AMERICA

WOOLWORTH BUILDING

233 BROADWAY, NEW YORK

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Wheeler N. Soper.........*Assistant Editor*

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American Building, Baltimore, Md.

T. M. Stevens.............*Superintendent*

Gulf Division

917 Decatur St., New Orleans, La.

E. C. Newton...............*Superintendent*

Great Lakes Division

Schofield Bldg., Cleveland, Ohio

F. H. Mason................*Superintendent*

Comment and Criticism

A correspondent writes as follows:

I notice with considerable interest the articles appearing in "Comment and Criticism" regarding the "swinging" of radio signals. This frequently occurs at my station. Some examples are WCC (Cape Cod, Mass.), WCY (Cape May, N. J.) who comes in very loud for certain periods and then dies out so I can scarcely hear him; WCX (Cleveland, O.), WBL (Buffalo, N. Y.) and others which have the same spark characteristics. This swinging does not seem to occur in the case of very distant stations. I am surprised at the case of WCC, which station is located within my normal daylight range. I also note that certain adjustments of the galena detector make the wave flatter or sharper than other adjustments, even though the signals are of the same intensity.—A. S., Jr., *New York.*

* * *

In the first place, how does our correspondent know that he is within the daylight range of WCC (Cape Cod, Mass.)? This station does not operate in the daylight and therefore he is unable to make tests. We should say that unless he employs an extremely sensitive detector that his station is located considerably outside the daylight range of Cape Cod. In fact, none of the stations he mentions are within the daylight range.

Therefore we reiterate our original statement that these effects (of swinging signals) are most noticeable from those stations which are situated outside of the daylight range of the receiving station.

* * *

Regarding the effect of the galena detector we quite agree with our contributor. A crystal of galena does not possess a particularly high value of resistance and, therefore, at certain adjustments may have such a low value as to seriously affect the constants of the local detector circuit (the secondary winding and the variable condenser in shunt). This would have the effect of increasing or decreasing the "sharpness" of tune, depending upon the adjustment at any particular moment.

* * *

Another reader, whose letter is signed A. S., Jr., writes:

In nearly every number of The Wireless Age somebody talks about using an "E" violin string for a cat whisker detector. This is impossible as these strings are made of gut. The metallic "E" string belongs to the mandolin.—A. S., Jr., *New York.*

* * *

The editor of this department offers his humble apologies to the entire amateur field for having allowed such an obvious error to escape his notice. Incidentally he has exposed his complete ignorance regarding musical instruments.

* * *

The following suggestion from one of our readers is worthy of consideration:

In the device for the elimination of dead-end losses described by Mr. Orth in your February, 1915, issue, page 366, a switch is shown which automatically disconnects all unused coils from the receiving circuit. Now, in order to reduce to a minimum, the absorption of energy by the unused coils, it may be of advantage to sub-divide these coils by opening the circuit between each one and its neighbor. The only case when this might be objectionable would be when the received wave had a period approximately equal to the natural period of one or more of the coils. With any given depth this point can easily be tested.

The object of this communication is to point out a simple addition to Mr. Orth's device whereby the sub-division referred to may be effected. It is only necessary to have the piece of insulating material on the blade of Mr. Orth's switch broadened out into the shape of a fan, so as to hold open the contacts of all coils except those that are in use. It is better not to let the insulating piece rub over that part of the surface of the metal

which is used in making contacts, as the metal may become fouled. Where there are so many spring contacts in series, it is highly important that each contact be as perfect as possible.—W. G. C., *Connecticut.*

Our contributor is quite correct, and in many instances it may be highly desirable to break up the continuity of the unused turns to prevent the flow of energy which might exist under certain conditions of resonance between the unused turns and the oscillatory circuit proper.

* * *.

This suggestion is recommended to amateur experimenters:

I have noticed in the "Queries Answered" department of The Wireless Age several inquiries requesting information which will enable the experimenter to eliminate the humming noises in the head telephone circuit of an audion set where the aerial is within the field of influence of alternating current power wires.

I have experienced the same difficulty, but find that it can be entirely eliminated by attaching a thin, flexible cord to the head band of my telephone, connecting it to earth. This, of course, is only feasible with head telephones having metallic bands. If this wire is wrapped neatly around the telephone cord it will not have a bad appearance.

I had previously noted the effect of touching an earth connection with the finger as your correspondent of last month had, and the series of experiments finally led me to employ the method mentioned.

I trust that this information will be of some help to amateurs who have experienced similar difficulties.—W. K. M., *New York.*

The metallic band of the ordinary head telephone is connected to the core of the electro-magnet. When this band is connected to earth it affords a slight capacity effect between the windings and the earth of just sufficient value to eliminate the objectionable noises due to electrostatic induction. In a previous issue we advised the use of a small "postage stamp" condenser to be connected to one terminal of the telephone windings to earth; the connection as described by our correspondent gives similar values of capacity effecting the same purpose in a more simple manner.

AUSTRIAN MEDAL FOR AMATEUR

Master Eugene Dynner, of Guttenberg, N. J., will be decorated with a medal by the Austrian Ambassador at Washington, in behalf of the aged Emperor Franz Josef, as soon as it reaches Washington.

Both the medal, and a hand written letter are now on their way, being sent in response to a wireless message of good-will that Dynner sent to the Emperor under his own name while he was operating the wireless station at the recent Charity Bazaar for the widows and orphans of the German, Austrian and Hungarian soldiers, held at the Seventy-first Regiment Armory, New York.

A special fifteen-day license was issued by the government at Washington to Master Dynner, and the apparatus used was his own.

The message to Emperor Joseph stated that the sender was taking the liberty, as a member of an Austro-Hungarian family, 14 years old, of sending to him the first message from the fair, over apparatus which he had himself patented, to give to the Emperor of his country his best wishes for his Fatherland.

A wireless reply was received from Count Lichtenstein, chief of the cabinet,

Eugene Dynner

in the name of the Emperor, thanking him, and stating that a hand written reply had been sent. A notice from Washington soon followed, advising him that a medal had been sent from Austria, with which he would be decorated upon its arrival.

Queries Answered

Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of an individual can be answered. To receive attention these rules must be rigidly observed.

Positively no Questions Answered by Mail

C. A. B., Ocean Grove, N. J., asks:

Ques.—(1) I have read a number of times in THE WIRELESS AGE that only the outside wires count in a flat top aerial. Would an aerial be more efficient if the wires were placed one above the other, the spreaders being in a perpendicular position?

Ans.—(1) We have no definite data regarding this, nor can we possibly see how there could be an advantage in so disposing the receiving aerial.

Ques.—(2) In the Marconi "Instructions to Operators" the wave-meter is shown with the head telephones connected in series with the detector and both shunted across the condenser. In a recent article in THE WIRELESS AGE the detector is connected to but one side of the variable condenser and the telephones shunted across it. Is this a misprint?

Ans.—(2) This is not a misprint. Either method may be employed. There is a slight advantage in the unipolar connection, however. Inasmuch as the head telephones and crystals are not connected in shunt to the wave-meter circuit they do not affect the constants of the instrument.

Ques.—(3) Please give me a full explanation of undamped waves.

Ans.—(3) Undamped waves are sent from a transmitting station when the antenna is traversed by undamped oscillations. A simple explanation may be offered as per the sketch (Fig. 1) where damped oscillations are represented as a series of decaying jigs. The undamped oscillations are represented by the continuous jigs which, as long as the apparatus producing them is in operation, flow continuously and without a break.

It should now become self-evident why undamped oscillations cannot be heard on the ordinary receiving apparatus; due to the fact that there are no discontinuities in the wave train there will be no variation of current in the telephone receiver to cause an audible sound, except at the opening and closing of the transmitting key. Undamped oscillations may be generated either by the Poulsen arc, by the Goldschmidt high frequency alternator (a low speed dynamo giving a frequency of 80,000 cycles per second) or by the Marconi method of producing continuous oscillations by overlapping discharges of a condenser through a series of properly adjusted spark dischargers.

W. F. E., Pittsburg, Pa., inquires:

Ques.—(1) Is the "popular variable condenser of the Murdock type" mentioned in the article "How to Conduct a Radio Club," in the February, 1915, issue of your magazine, the variable shown in the clipping which I enclose? You will note that the advertisement states that this condenser has a capacity of .0005 microfarads, maximum capacity, while the article referred to states that the capacity is .0098 microfarads.

Ans.—(1) The condenser referred to is the next larger size which is supposed to have a capacity value of .001 microfarads.

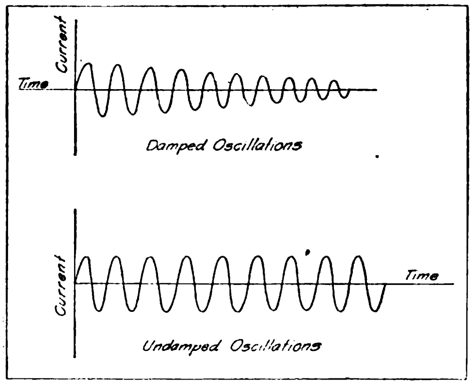

Fig. 1

Ques.—(2) Could you suggest a way to make a coil from 3 to 3¼ inches in diameter which would be equivalent to the coil on page 380 (the same article) under the subhead, "An Amateur's Wave-Meter"? I wish to use this coil as the secondary winding of my loose-coupler to test the waves of some of the stations in my vicinity.

Ans.—(2) Forty-two turns of No. 26 S. S. C. wire, wound on a form three inches in diameter, will cover the same range of wave-length as the coil described in the February issue.

* * *

J. W. T., Ossining, N. Y., asks:

Ques.—(1) I have an aerial composed of two copper-clad wires 85 feet in length by 35 feet in height, spaced two feet apart. The lead-in has a length of 10 feet. What is the wave-length and the capacity of my aerial?

Ans.—(1) The wave-length of your aerial is approximately 210 meters and the capacity about .0002 microfarads.

Ques.—(2) In connection with the aerial referred to I use an Adams-Morgan loose coupler, a large loading coil, variometer, fixed condenser, galena and silicon detectors, potentiometer and 75 ohm phones. What is my approximate day and night range?

Ans.—(2) Your day range is in the vicinity of 100 miles and your night range 600 miles.

Ques.—(3) Is the enclosed hook-up correct for the set referred to?

Ans.—(3) Yes.

Ques.—(4) Where can I obtain information regarding the construction of an instrument for measuring the wave-lengths of incoming signals and for finding the wave-lengths of my coils?

Ans.—(4) You should note carefully in the February, 1915, issue of The Wireless Age the article, "How to Conduct a Radio Club," which gives complete data for the construction of an amateur's wave-meter; also read carefully Chapter VII of "Operators' Instruction" appearing in the February, 1914, issue of The Wireless Age. Full instructions are given for determining the wave-length of the receiving circuit.

Ques.—(5) Do two 1-inch spark coils connected up in series give as much satisfaction as a 2-inch coil?

Ans.—(5) When two coils are used in this manner the primary windings should be connected in series, also the secondary windings. The interrupter of one coil should be screwed up tight and the circuit interrupted for both coils by a single interrupter. A single spark coil which gives a 2-inch spark is preferable.

* * *

G. H. B., Stanbridge, East, P. Q., Canada, asks:

Ques.—(1) Is there any practical apparatus or system for producing an electric arc at 500 volts and from 1/10 to ¼ ampere for wireless telegraph and telephone transmission to distances up to about 1,000 feet? This is to be used for experimental purposes.

Ans.—(1) It is extremely difficult to maintain a satisfactory working arc with such small current consumption. On page 296 of the January, 1915, issue of The Wireless Age there appeared a complete description of a small arc generator suitable for your purposes, but you will find that for satisfactory working, a consumption of from 2 to 5 amperes is required.

Ques.—(2) Where can a small direct current generator of 500 volts and 1/10 to ¼ ampere be purchased? If such a machine could be made at home, please give specifications.

Ans.—(2) You will find it difficult to purchase such a machine from the stock on the market. It would have to be specially constructed. Specifications for the construction of a generator are outside the scope of this department.

Ques.—(3) Has there been any instrument or device invented which is selective to frequency (in a wireless receiving set) or that may be adjusted to respond to a given spark frequency and to be inoperative to any other frequency?

Ans.—(3) Several devices for this purpose have been produced by the Marconi Company. They are known as "group frequency" tuners and enable the receiving operator to separate distant transmitting stations having different spark frequencies, even when operating on identical wave-lengths. The circuits and construction of this apparatus are not available for publication at present.

Ques.—(4) Please give a list of colleges in the United States where wireless engineering is taught.

Ans.—(4) The College of the City of New York, New York City, and Columbia University, New York City. We have no knowledge that wireless engineering is being taught outside of these two institutions.

* * *

J. C. L., Jr., Baltimore, Md., asks:

Ques.—(1) What is the wave-length of my aerial which is made up of three strands of bare aluminum wire, spaced 18 inches apart? The aerial is 75 feet long by 30 feet in height at one end and 10 feet at the other end. The lead-in is taken off from the highest end. The ground lead is 30 feet long.

Ans.—(2) This aerial has a natural wave-length of about 190 meters.

Ques.—(2) What should be the dimensions of a 3-slide tuner to receive a wave-length of 1,600 meters and to be used in connection with my present aerial?

Ans.—(2) A coil 3 inches in diameter by 10 inches in length, wound closely with No. 26 single silk covered wire, will give the range desired.

Ques.—(3) Is a tikker connected to the receiving set in the same manner that a crystal detector is?

Ans.—(3) Yes, but owing to the fact that the tikker is a low resistance device, the fixed stopping condenser of the local detector circuit becomes active as an element of the closed oscillatory circuit and the wave-length of that circuit is considerably increased over the value which is attained when a high resistance crystal is used.

Ques.—(4) How is the wave-length of a receiving tuner (straight) ascertained?

Ans.—(4) Preferably by direct measurement with the wave-meter.

Ques.—(5) How can I find the wave-length of any aerial in meters?

Ans.—(5) This is also preferably done by means of a wave-meter. It is possible to calculate the capacity and inductance and therefore, the wave-length of the antenna by complicated formula. You should study the article on "How to Conduct a Radio Club" in the February, 1915, issue of The Wireless Age, where the construction of an amateur's wave-meter is fully described. Previous issues of The Wireless Age have contained complete information for the tuning of a transmitting set or determining the wave-length of the receiving set.

H. L. Z., New York, N. Y., writes:

Ques.—(1) I find I can hear Sayville when I tune to 700 meters, although the operators are at that time sending at 2,800 meters. Is this because my wave-length is a factor of that used by WSL? Would the signals come in louder if I could tune to 1,400 meters?

Ans.—(1) This phenomenon has been noticed at many receiving stations located within 100 miles of Sayville. It is very probable that the 700-meter wave which we all hear is due to reradiated energy from the mast stays at the Sayville station. These short wave-length signals are generally heard on a wave-length of about 600 meters instead of 700 as you state. No increase in the strength of these signals may be expected by tuning to 1,400 meters which, of course, should be very loud on the fundamental wave-length, 2,800 meters. At the present time the Sayville station operates on a wave-length of 4,800 meters.

Ques.—(2) Kindly give the best hook up for the following instruments: double slide tuning coil, galena detector, silicon detector, fixed and variable condensers and a 2,000-ohm head telephone set.

Ans.—(2) A complete diagram of connections is given in Fig. 2. This is the most efficient hook-up that could be employed.

* * *

J. G. K., Chicago, Ill.:

The Fleming oscillation valve may be purchased from the Sales Department of the Marconi Wireless Telegraph Company of America, 233 Broadway; price $5 each. The purchaser assumes all risk of breakage during transportation.

* * *

R. W. P., South Framingham, Mass., inquires:

Ques.—(1) Why was the wireless station at Brant Rock, Mass., abandoned?

Ans.—(1) This station has not been abandoned, but experiments have temporarily ceased.

Ques.—(2) Does the "Humner" transformer come up to the wireless requirements?

Ans.—(2) We are not at all familiar with this type of apparatus and therefore cannot answer.

Ques.—(3) What is the wave-length of an aerial 75 feet in length, 40 feet from the earth, consisting of 4 wires placed 5 feet apart?

Ans.—(3) The wave-length of this aerial is about 210 meters.

* * *

S. B., Xenia, Ohio, writes:

Ques.—(1) I am a student in the Telegraph Department of the Ohio Soldiers' and Sailors' Orphan Home School. I am constructing a small wireless set and want instructions on how to make a good sending condenser. I do not understand the construction of a condenser of the right capacity to be used with a 1 inch spark coil. I expect to use heavy tin foil on 6 x 7 inch photographic plates.

Ans.—(1) It is rather difficult to give definite advice for the construction of a condenser suitable to these small coils, due to the differences in construction of the vibrator and the constants of the windings. A condenser of proper dimensions for a 1 inch spark coil has an exceedingly small value of capacity. It is possible that a single plate of glass having the size you suggest will be quite sufficient. A greater distance will be attained if you connect the spark gap directly in series with the antenna, using neither oscillation transformer nor condenser. An amateur supply house located in New York City manufactures a small test tube condenser for use with these coils. The article appearing in the November, 1913, issue of The Wireless Age entitled "An Amateur's Set," may aid you in the construction of a satisfactory condenser.

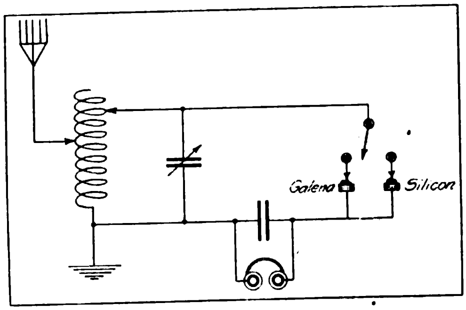

Fig. 2

* * *

G. C. C., Pittsburg, Pa., asks.

Ques.—(1) What is the wave-length of my aerial, which consists of 2 wires 8 feet apart, 200 feet in length by 75 feet in height?

Ans.—(1) Approximately 425 meters.

Ques.—(2) How far can I send with a ¾ k. w. set consisting of a transformer, condenser, helix, rotary spark gap, anchor gap, all of which are connected with No. 4 standard copper wire?

Ans.—(2) The actual distance you may cover depends largely upon the local conditions surrounding your station. Your maximum range is from 40 to 60 miles, depending upon the type of apparatus used at the receiving station.

Ques.—(3) How far can I receive with a loose coupler, loading coil, two Murdock variable condensers, RJ4 vacuum valve detector, and 2,000 ohm head telephone?

Ans.—(3) 1,000 miles by night, 150 miles by day, from stations of smaller power. You should be able to hear the Key West naval station at Key West, Fla.

Ques.—(4) What is the capacity of my condenser, which consists of 8 x 16 inch plates, ⅛ inch in thickness, covered with tinfoil 6 x 12 inches?

Ans.—(4) Each plate of your condenser has a capacity of about .001 microfarads.

Ques.—(5) What size series condenser must I use to reduce the wave-length of my aerial to 200 meters?

Ans.—(5) This aerial is too long for satisfactory operation on a 200-meter wave. It cannot be reduced by a series condenser.

* * *

G. N. H., Scranton, N. J., inquires:

Ques.—(1) Please classify the enclosed list of detectors.

Ans.—(1) Electrolytic, galena, carborundum, Fleming valve, perikon, silicon.

Ques.—(2) Is the Fleming valve detector as sensitive as any mineral or electrolytic for distance and loudness?

Ans.—(2) When used in a special circuit the Fleming valve detector is more sensitive than carborundum, but for the present the details of this circuit cannot be published. The Fleming valve as used in the ordinary manner will give, from near-by stations, considerably louder signals than any other type of detector.

Ques.—(3) Will two Fleming valves make a set more sensitive? If so, how would you connect them? Please publish a diagram.

Ans.—(3) The circuits for this arrangement are not available for publication.

Ques.—(4) What is the wave-length of an aerial 425 feet in length by 50 feet in height, the lead-in being 75 feet in length? The aerial consists of 7 strands of No. 22 B. & S. copper wire. What is the capacity?

Ans.—(4) The natural wave-length of this aerial is about 770 meters, and the capacity about .0015 microfarads.

Ques.—(5) With this aerial, the Fleming valve and accessory instrument as shown in the September, 1914, issue of this magazine, how far should I be able to receive day and night?

Ans.—(5) Night range 1,000 miles, day range 200 miles. With the silicon detector the distance will be considerably increased. You should hear the Arlington station in daylight.

* * *

A. W. S., Hudson Falls, N. Y., writes:

Ques.—(1) In the January, 1914, issue of The Wireless Age E. E. Bucher, in his article, "How to Conduct A Radio Club," places a monetary cost in his estimate on the cost of a vacuum valve set of $2.10 for 15 No. 503 ever-ready cells, giving approximately 60 volts. My effort to find this particular cell in the "American Ever Ready" catalogue, at a cost of about 14c.—Mr. Bucher's estimate—has proven fruitless. In the catalogue is listed, however, battery No. 703, consisting of three cells, giving a total of about 3.5 volts, costing approximately 30c. at wholesale. On this basis it would require 17 batteries to produce the 60 volts necessary for the head phone circuit at a cost of about $5, an increase of $3 over his estimate. Please tell me where I can secure the ever-ready cells stipulated in the article cited at his estimated cost. I contemplate conducting some experiments in which I will use several vacuum valve detectors, but it is essential to keep the cost down to the lowest possible minimum.

Ans.—(1) At the time the article in the series on "How to Conduct A Radio Club" was written it was possible to purchase ever-ready cells at a supply house in New York City at the price named. Since that time, however, such offers have not been advanced, but the cells can now be purchased from the E. I. Company, New York, at a price of 25c. per unit.

* * *

D. W. D., Tracy, Cal., writes:

Ques.—(1) On certain loose coupled tuners, two wires are apparently wound in parallel. What is the idea of using the two? Are both wires brought on to the same taps on the switch, or is one used only and the other as a safety wire?

Ans.—(1) We have never seen a tuning coil of this construction. Perhaps you have misunderstood the design of such coils. Generally when multiple point switches are used to vary the values of inductance, a loop of wire is brought out from some portion of the tuning coil winding to a point on the multiple point switch and then returned to the winding and continued.

Ques.—(2) I would like to use stranded wire for winding my tuner. No. 18 lamp cord is almost too heavy. What would be appropriate?

Ans.—(2) It is not necessary that receiving tuners be wound with stranded wire. There is a type of wire known as "Litzendraht" which consists of a very great number of fine wires, made in a cable, each wire being insulated from its neighbor. We believe it will be difficult to purchase this wire during the European war.

* * *

W. K. W., Toledo, Ohio:

The fact that your new aerial, since the storm, is 20 feet less in height than the one formerly employed, will make little difference on your long distance work; in fact, not sufficient to worry about it.

Regarding your second query: The Marconi School, formerly located at Cleveland, has been permanently closed and the instruction work transferred to Dodges Institute at Valparaiso, Ind.

For an interpretation of the list of calls given in your third query, we suggest that you secure a copy of the International Call List from the Berne Bureau at Berne, Switzerland. Some of the abbreviations which you enclose and believe to be call letters of vessels, are well known abbreviations in commercial working.

Regarding your fourth query: A transformer with a secondary voltage of 5,000 or 6,000 is too low to give satisfactory operation in connection with a rotary gap. Please observe carefully that when you employ a non-synchronous rotary spark gap in connection with a 60-cycle source of current supply, that the note when listened to at the spark gap, may seem very irregular and rough; when listened to at a distant receiving station, however, it may have pleasing musical characteristics. We are inclined to believe that you did not listen in on your

receiving apparatus. If you had done so the note might have been considerably smoother than it appeared to be when listening to the rotary direct.

The condenser as described is too small for the purpose. You require 20 plates of 5 x 7 glass covered with foil and all connected in parallel. Perhaps the spark electrodes were too large and therefore caused a rough note. These should not be more than 3-16 of an inch in diameter with a set of the dimensions referred to.

Ques.—(5) I recently asked an operator to give me a good design for an oscillation transformer. He said to make the primary on a form about 8 inches in diameter, placing the turns about ¾ inch; furthermore, to slide the secondary inside it; secondary to have 8 turns, placed ¾ inch on a form 6 inches in diameter. The primary to be wound with No. 2 aluminum wire, 6 turns; the secondary 8 turns of No. 7 stranded copper aerial wire. He advised me to make a loading coil for the aerial circuit. He figured that rarely more than 3 turns were used in the primary and not many more than 8 in the secondary, so there is no necessity for making it larger. Is he right? Can you suggest any improvement?

Ans.—(5) In the main, your friend's statements are quite correct and there is no advantage in using more than 8 turns in the secondary winding. Of course the number of turns required in either the primary or secondary windings would depend upon the size of the set and the range of wave-length over which it is expected to work. As far as an amateur set is concerned, however, your friend's advice is good and the oscillation transformer of the dimensions given should work satisfactorily. With the average amateur ¼ k. w. transmitting set, we have found by experiment that the secondary winding may consist of a few turns of very heavy rubber covered wire, wound closely, the insulation being quite sufficient to hold the potential.

* * *

J. A. C., Brooklyn, N. Y.:

We have read carefully your communication in reference to the apparent poor working of your receiving station and can see nothing wrong with the design of your apparatus. You should be able to reach a wave-length of 3,500 meters with little difficulty. Your aerial seems to be of fair proportions and you should therefore receive certain of the stations named in your communication. We are led to believe that your aerial is in some manner unfavorably located for the reception of long distance signals and for this reason cannot give specific advice which will enable you to solve your difficulties. There is a possibility that your apparatus is improperly connected. There may be an open circuit in some of your windings or perhaps a loose connection to the earth. Your aerial may easily be loaded to obtain a wave-length adjustment of 3,500 meters without loss. Data for coils of definite wave-lengths are given in the February 1915, issue of The Wireless Age in one of the series of articles on "How to Conduct A Radio Club."

* * *

D. M., Amboy, Ind.:

Ques.—(1) What is the proper spacing of the turns for ½ k. w. helix? The coil is 10 inches in diameter and is wound with No. 6 aluminum wire.

Ans.—(1) The spacing depends upon the voltage employed. In this case ½ inch between the turns is quite sufficient.

Ques.—(2) Please tell me why it is that a telephone receiver with the diaphragm removed and connected across the vibrator of a high frequency buzzer will reproduce the sound?

Ans.—(2) This is due to the molecular vibration of the core of the receiver magnets.

Ques.—(3) I have a 3,000-meter, double slide tuning coil, a variable condenser, one small and one large fixed condenser, two galena detectors and 2,000-ohm Brandes and E. I. Company's professional receivers. My aerial is 100 feet in length and about 70 feet in height. What change must I make to tune into the new stations using 10,000 to 17,000 meters?

Ans.—(3) In the first place there are no stations working on 10,000 meters or 17,000 meters at the present time within your range. You should re-design your entire equipment. You will find the single coil as described even when "loaded" with an aerial tuning inductance and an additional loading coil in the secondary winding, an unsatisfactory arrangement for this purpose. Note the article on "How To Conduct A Radio Club" in the February, 1915, issue in which a 10,000 meter secondary winding suitable for your purposes is fully described.

* * *

J. W. D., Peekskill, N. Y., inquires:

Ques.—(1) Who has been using the wireless telephone that I have been hearing recently? The signals come in fine, but the station does not give any sign. I hear only music.

Ans.—(1) This is the Marconi experimental wireless telephone station at the Wanamaker station, New York City.

Ques.—(2) Please tell me the wave length of an aerial 100 feet in length, the lead-in being 40 feet taken from the center, and the aerial consisting of 6 wires.

Ans.—(2) The wave-length of this aerial is about 275 meters.

Ques.—(3) Is an oscillation transformer with a primary winding, comprising 3 turns of No. 8 wire, 15 inches in diameter, and a secondary winding of 8 turns, made of No. 6 wire, suitable for a 1 k. w. set?

Ans.—(3) Whether or not this oscillation transformer has proper dimensions for your purposes depends upon the size of the aerial with which it is to be used or the wave-length with which the set is to be worked and the condenser capacity to be employed in the closed oscillatory circuit. If it is to be used in connection with a condenser for a 200-meter set, the design as described is quite satisfactory.

Ques.—(4) How much more efficient is

the quenched gap than the rotary gap? Can you give me definite data on a quenched gap?

Ans.—(4) For small power, the quenched gap ordinarily gives a higher value of efficiency, but this type of spark discharger cannot be employed to best advantage with the ordinary types of transmitting apparatus. For maximum efficiency a properly designed quenched spark gap should comprise correlated apparatus from the generator up to the quenched gap itself; that is to say, the generator-transformer, condensers and gap should be specially designed to meet the requirements. If an amateur employs a quenched gap on a set of ordinary construction, the oscillation transformer should be so constructed that a continuously variable value of inductance may be obtained, and the coupling features of the coil should be so constructed that the coupling may be quickly and easily adjusted to any value desired within reasonable limits. For very large powers such as are used at the high power Marconi stations, the rotary spark gap is preferable, because the amount of energy that may be handled with it is practically unlimited.

Ques.—(5) Is a lightning switch an absolute necessity to the safety of a house having a tin roof?

Ans.—(5) Do you desire to ground the tin roof through a lightning switch, or do you refer to the aerial? It is not a bad idea to have a lightning switch on the antenna or at any wireless station although you are perhaps aware that the antenna is always earthed when the aerial lead is connected to the secondary winding of the transmitting oscillation transformer.

* * *

C. H. P., Waukesha, Wis.:

Ques.—(1) I have an aerial consisting of 4 No. 12 copper wires, spaced 1½ feet apart. It is 60 feet in length, 40 feet in height and has 2 wires leading down from the flat top, as shown in the accompanying diagram. All of the dimensions are indicated thereon. Please tell me what the wave-length of the aerial is.

Ans.—(1) The natural wave-length of your aerial is approximately 175 meters.

Answer to third query:

The first described receiving set needs a loading coil of fair dimensions, while the second set has insufficient turns in either primary or the secondary windings. The primary winding of the second set should have at least 240 turns of No. 26 wire, while the secondary winding may have 300 turns. The secondary winding should be shunted by a condenser of .001 microfarads.

Ques.—(3) My aerial is not parallel to any A. C. power line, but I can tell when the generator at the power house is being started and generally after this I have to suspend operations until morning when the induction stops. I have tried all the numerous ways described in The Wireless Age, but to no avail.

Ans.—(3) Inasmuch as you have tried practically every possible means to eliminate this induction we fear that it can only be overcome by moving your station. It is a fact that at certain locations it is absolutely impossible to overcome the induction from nearby alternating current power lines. It is not necessary that your aerial should lay parallel to alternating current wires, although the effects are at a minimum when the antenna is so disposed. You might try as a remedy two 1-microfarad condensers connected in series and earthed at the middle point. This may reduce the inductive noises to some extent.

Regarding your fourth query:

Complete instructions were given for an amateur's wave-meter in the article on "How To Conduct A Radio Club" in the February, 1915, issue of The Wireless Age.

* * *

F. G. B., Greensburg, Pa., asks:

Ques.—(1) Please tell me the natural wave-length of a 6-wire aerial, 169 feet span, spread 10 feet at one end, 50 feet at the other; lead-in wires, 40 feet in length, consisting of No. 14 stranded copper.

Ans.—(1) The natural wave-length of your antenna is approximately 420 meters.

Ques.—(2) To reduce the wave-length of this aerial to 200 meters would it be practical to use a series condenser? If so, please state the size.

Ans.—(2) The natural wave-length of this aerial is too great to be operated satisfactorily on a wave-length of 200 meters.

Ques.—(3) Would it be better to use the two outside wires of the aerial referred to and take the other four down?

Ans.—(3) Not necessarily. There is little advantage either way.

Ques.—(4) What would be the natural period of a 2-wire aerial and what size condensers should be connected in series to reduce the wave to 200 meters?

Ans.—(4) The natural period of a 2-wire aerial having similar all around dimensions will be a little less, possibly about 390 meters, and it is still rather lengthy to be operated on a wave-length of 200 meters. If you desire to transmit on a wave-length of 200 meters, we suggest that you reduce the size of the aerial. You will find data on this subject in previous issues of The Wireless Age in the "Queries Answered" Department.

* * *

J. F., Unioncourse, N. Y.:

We cannot give data for the construction of the loading coil unless we know the size of the aerial and the general construction of the receiving tuner with which it is to be employed. The data which you gave in connection with your receiving tuner is not sufficient for calculation, and we therefore do not know whether you will be able to receive signals from Arlington.

Concerning your third query:

It is advisable if possible to erect a larger aerial; certainly you will receive better signals from Arlington than with the smaller one.

Classified Advertising

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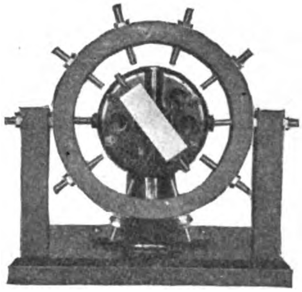

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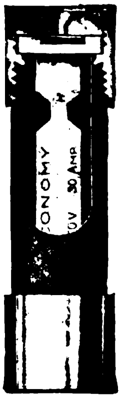

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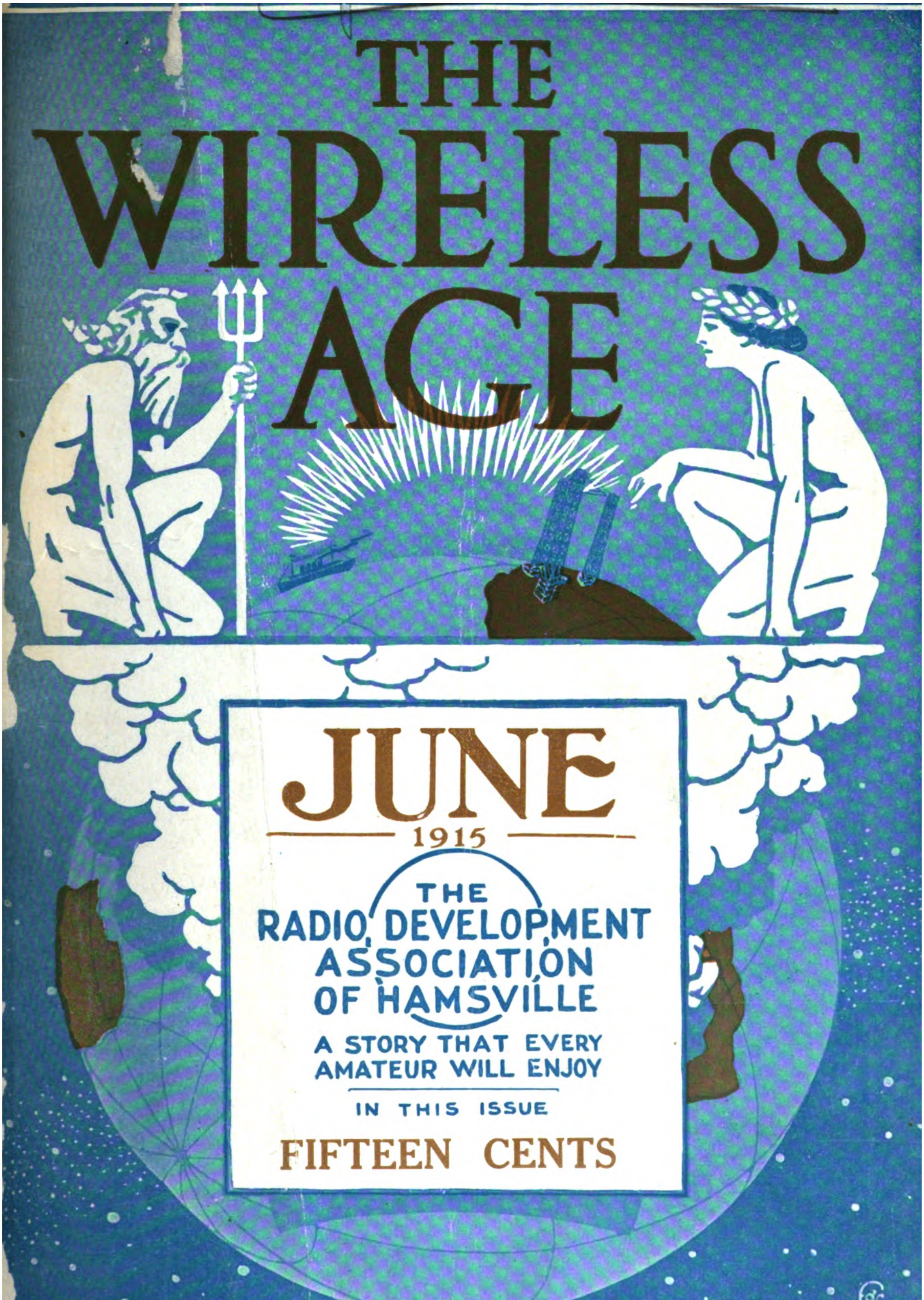
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THE WIRELESS AGE

An Illustrated Monthly Magazine of
RADIO COMMUNICATION

Incorporating the Marconigraph

J. ANDREW WHITE, Editor — WHEELER N. SOPER, Asst. Editor

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CONTENTS

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THE WIRELESS AGE

JUNE, 1915

The Ownership of Wireless Equipment

Some Replies to the Invitation to Comment on an Earlier Article

In the March issue appeared an article which discussed the question of the proper ownership of steamship wireless equipment — whether it should be acquired by outright purchase and operated by steamship owners, or whether it was best to have it remain the property of the Marconi Company, leased to the steamships but operated as part of the Marconi system. The article also considered some phases of the Government Ownership question. Shipowners, commercial wireless men and those in government service, scientists and economists, were asked to contribute affirmative or negative arguments—particularly the latter were wanted—and assurances were given that the best of these would be published. This invitation was prominently displayed at the end of the article and supplemented by personal letters from the Editor.

Some replies have been received. Whatever inferences may be drawn from them are overwhelmingly in favor of this magazine's particular viewpoint. We did not look for support; we hoped for and would have welcomed opposition. It appears, however, that the choice has been taken out of our hands, and so, as constituting part of the symposium of national significance, they are printed here without comment.

In a leading editorial the Philadelphia Record said on April 29:

Leased Wireless Equipment

Should steamships own or rent their wireless equipment? At first sight this seems a trivial question. However, a comparison with conditions as they exist in another service for long-distance communication will show that there is something in it. When a Parisian decides that he can no longer do without a telephone in his office or residence he first goes to a manufacturer to buy an instrument that suits his fancy; next, he files an application in the Department of Posts and Telegraphs to have the instrument installed and connected. Within a week or two somebody will come along to hook him up with "Central." When the job is done he will find that he has incurred an expense of about 12 cents a yard for a larger or smaller fraction of a mile of wiring, from $20 to $50 for his instrument, and is also required to pay $20 or so in advance for three months' service, besides a deposit for possible long-distance calls.

Subscribers to a telephone exchange in the United States have no such trouble. A notice given in the morning may result in the installation of a leased instrument in the afternoon, and thereafter the subscriber has nothing to do but to pay his monthly rental and the tolls for extra calls. He does not incur any expense for repairs, and his equipment will be kept up to date with the march of improvement. This care-free condition would be the lot also of a shipowner who hires his wireless equipment. When worn out it would be renewed without additional cost, and the lessee, unlike

the owner, would not be haunted by the fear that his costly receivers and transmitters were going out of date.

A wireless installation, like a telephone instrument, is only a part of a system of communication. Standing by itself, an individual wireless equipment is valueless; it becomes a thing of worth only when it is connected with a base. Such a base is the shore station of an aerial telegraphic system. It is true that no wireless telegraph company can refuse to receive at its shore stations or to transmit messages sent from ships at sea; but this rule established by international agreement applies only in case of distress. It is true also that any ship can communicate with any other ship in a given radius, according to the power of the equipment used. Shore connections, however, may be frequently desired on occasions that could not be defined as emergencies under the international rule. The owner of a freighter may desire to communicate with the master of the vessel so that he can direct the cargo to another port than the one for which it was cleared, because of a more favorable market for the goods. This is only one of many instances that could be cited. Such service could be obtained only by renting a wireless installation from a commercial telegraph company which has licensed shore connections. The question put above is thus answered. No monopoly or restraint of trade is involved. The renter of wireless equipment has his choice between competing companies. The choice is determined by considerations of convenience and the relative efficiency of the service given by competitors.

The S O S and Ownership

The opinion of the newspaper and that of the interested individual sometimes present wide contrasts. To widen the gap geographically ordinarily assures or accentuates a difference of opinion. But not in this instance. The following was received from London, over the signature of an official high in commercial wireless service:

"The subject has been so exhaustively treated that there appears nothing to add. There is no doubt that centralization is of the utmost importance and efficient working is quite impossible without it. If all shipping companies owned their installations there would be constant friction among the operators and we should find shipping companies supporting their operators one against the other when disputes had to be settled, whereas at the present moment when the Marconi Company employs all men, justice and control can be maintained. The efficiency of the S O S arrangement also might be considerably lessened in the case of individual ownership, because a shipping company would not be able to decide if an operator should or should not have received signals, and where the interest of rival companies is concerned it might happen . . . that it would be considered better to ignore the call and not delay the steamer. As it is, the operator being a Marconi employee would have no interest in doing so and would always be a witness against anything of the kind."

The Article of Great Value

The following appeared in the response of another British official:

"I have read the article through with the greatest interest and I think it will be of great value to American readers.

"After many years of experience only to the extent of some one per cent. of the total British mercantile vessels fitted with wireless have the owners gone in for outright purchase."

This was received from Canada:

"Personally, I have always been impressed with the superficial disregard by shipowners of the immense value from every point of view of the Marconi organization placed at their disposal under the rental system. While recognizing in the abstract and in definite concrete cases the unquestionable value of wireless equipment, shipowners appear to cherish an inherent resentment against the comparatively small cost entailed as an unwarranted imposition upon them by designing corporations, or by a government paternalism which they regard as interference with the liberty of the subject!

They shut their eyes to the point so ably brought out in your article, proving the worthlessness of ship equipments without corresponding shore stations and the maintenance of a surplus staff capable of supplying qualified men to take charge of vessels at a moment's notice, both of which necessary adjuncts to the ship stations can only be carried out and maintained at enormous expense to the operating company. Your point with regard to the necessity of thorough acquaintance with the international jurisprudence now underlying and governing worldwide wireless, including proper forms of accounting and distribution of tolls is also well brought out.

"You have asked for my opinion of this first installment of a series of similar articles which you propose to publish. The matter is excellent, if only the shipowners can be induced to devote the time and attention to the article which it deserves."

Another, and perhaps the most interesting communication, came from Canada. It read:

"The matter has been dealt with very thoroughly by the author, so that it is hardly possible to make further comment.

The Problems of Operation

"To anyone familiar with the intricacies and difficulties encountered in the operation of a wireless telegraph system, in supervision, in the supply of spare parts and repairs, in the compliance with government regulations in all countries, in accounting, and in the handling of complaints, it is not necessary to give the matter much consideration to appreciate how hopeless it would be for the majority of steamship companies' organizations to endeavor to cope satisfactorily with these problems.

"Possibly the larger steamship companies who would have fifty or more wireless installations could afford to establish an organization to run their own wireless service, but even with such a large fleet as this, the steamship company would be under a serious handicap when the necessity arose for furnishing parts or renewals at distant ports.

"With regard to the question of government vs. private operation, the undesirability of government operation of any public utility has also been very thoroughly dealt with by the author. In taking the British Post Office Telegraph Service as an example of government operation of a telegraph system the author has taken what is probably the most successful of all public utilities operated by government, and even this, as the author has shown, has been commercially a gigantic failure.

"To come nearer home and to consider government operation of wireless telegraph stations as compared with company operation of wireless telegraph stations, it might be pointed out that in Canada there are two systems of wireless telegraph stations, one on the British Columbia coast and one on the Great Lakes. There is the same number of stations in each of these systems, the power and range of the stations is practically the same, the service maintained by the stations is excellent in each case. The West Coast System is operated direct by the Canadian Government, the Great Lakes System is operated by the Marconi Company under contract with the Canadian Government. The cost of operation of the West Coast System as given by the Government Blue Book for 1914 averaged $4,890 per station, whereas in the case of the Great Lakes the Government pays a subsidy of $3,500 per station, out of which the operating company must make a profit. Furthermore, in the case of government operation there is a considerable amount of overhead expense not charged to the stations.

Cannot Improve on Marconi System

"It seems to me that there is no likelihood of any government entering into the operation of Wireless Telegraph Apparatus on board ship. The governments will confine their attention to the regulations of wireless operation and to the insistence on more powerful and more efficient equipments as scientific progress renders such improvements possible. With these increasingly stringent regulations it would seem that the only possible means of carrying on the operation of wireless

equipments on board ship is the present system as organized by the Marconi companies throughout the world."

An American wire telegraph official commented thus:

"Most of the trouble in handling the telegraph lies in the proposition expounded by the Nazarine: 'Ye cannot serve two masters,' and no one knows more than you about the trials and tribulations of the telegraph companies with the conditions surrounding private wire and railroad operators.

"I like the phrase 'Marconi men have never failed'—it lines up with Richelieu's 'There is no such word as fail,' and Lord Nelson's 'England expects every man to do his duty.' As I read it, it means: Marconi men are trained to do the right thing in all emergencies —and that is a wonderful boast.

"The Government Ownership article has a punch and is unanswerable."

What They Think of Us

I was formerly one of your subscribers but when circumstances compelled me to cease taking your magazine it was almost as if I had lost a valuable piece of my radio apparatus. THE WIRELESS AGE should have a place on every up-to-date radio set. I have been getting copies from the newsstands, often having to wait until another supply can be obtained, so eagerly they are snapped up by our amateurs of this town.—W. S. P., *Massachusetts.*

* * *

By way of appreciatiton I would like to say that of all my electrical magazines, of which I have over 150 copies, THE WIRELESS AGE holds first place. I only wish that there was twice as much in them.—E. R. G., *Ohio.*

* * *

I am glad to see this publication again, as I think it is one of the best on the subject of radio work.—G. T. D., *New York.*

* * *

I think THE WIRELESS AGE the best paper for radio fans to read, as everything is dealt with clearly, and the Question and Answer Department alone is worth the price of subscription.—H. G. M., *Pennsylvania.*

* * *

Your "Between the Log Lines" is appreciated, We amateurs are always interested in the doings of commercial operators.—K. H., *Ohio.*

* * *

I have been a constant reader of THE WIRELESS AGE for some time, and find many valuable hints, besides the fine stories, especially "The Eye of the Wireless" in the November issue, and "The Long Arm" in the December issue, and think it is well worth the price.—H. G., *Rhode Island.*

* * *

The magazine is not new to me, for I have been a regular reader of it ever since I started buying it at a newsstand last July, and although I have to go to Omaha to get it each month I would not miss it for several times the price. To speak plainly and to express the opinion of the other boys around here, it is worth about ten of the so called numbers of "The World's Advance," as far as radio work is concerned—and that is what we are looking for.—I. K., *Iowa.*

* * *

Our club has a subscription to THE WIRELESS AGE as a part of its library. It is the only wireless magazine which the club has thought worth while taking.—R. S. M., *Ohio.*

* * *

THE WIRELESS AGE and the 'phones are the two important things in a wireless station. I couldn't be without either.—C. M., *Massachusetts.*

Operator McCormick, who was rescued. He took the last photographs of the sinking of the Lusitania, but his films were spoiled by the water

Marconi Men Cool in Sea Tragedy

The Story of the Devotion to Duty of Operators McCormick and Leith as the Lusitania Sank

IN the biggest sea tragedy of the European war, which occurred on May 7 ten miles off Old Head of Kinsale, Ireland, when the steamship Lusitania was torpedoed and sunk by a German submarine, Marconi Operators Leith and McCormick acquitted themselves with credit, remaining on the vessel to send the S O S even as the ship was being drawn down into the waters. The wireless appeal spurred those on land and sea to render aid, the number of saved being estimated at seven hundred and sixty-four. It is estimated that 1,157 persons lost their lives. No definite news regarding the fate of Leith has been received, but it is known that McCormick was rescued.

The Lusitania left New York on May 1, reaching the point where she was destroyed early in the afternoon. The sea was smooth and the vessel, it is estimated by passengers, was proceeding at the rate of about fifteen knots an hour. It was about fifteen minutes after two o'clock when some among the passengers who had finished luncheon went on deck. Their attention was attracted by an object in the water at a distance of approximately 150 yards from the bow of the vessel. At first they believed that it was the tail of a fish. Then they saw that the water was seething around it and some suspected that it might be the periscope of a submarine. Immediately afterward they saw the torpedo start toward the vessel.

Captain W. T. Turner, commander of the Lusitania, was on the bridge. He saw the torpedo and tried to change the course of the vessel. The torpedo kept steadily on, traveling, as it seemed to those who were watching it, at the rate of about five knots an hour. It was fired just as the Lusitania came abreast of the submarine, striking the big vessel under the forward cabins and the bridge. The impact was ter-

rific, the ship quivering and shaking under the blow. A tremendous explosion followed, hurling a great quantity of water and debris into the air.

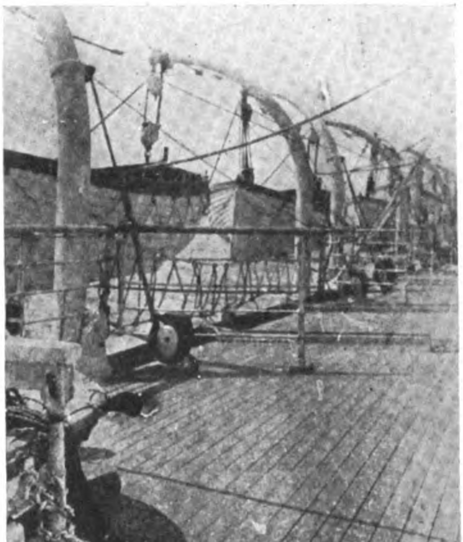
The Lusitania sank twenty minutes after she had been torpedoed, leaving only a brief time for those who had not been killed by the explosion to seek means of safety. Many persons did not have an opportunity to make an attempt to save their lives, being carried down with the liner when she plunged beneath the waters. Others jumped overboard and met death.

In charge of the wireless were two Marconi men—Robert Leith, the first operator, and David McCormick, his assistant. They sent the S O S call broadcast, the appeal being received by both ship and shore stations. When word of the disaster reached Queenstown, Admiral Coke, in command of the naval station, dispatched all the assistance available to the scene. Among the vessels which were sent speeding to the rescue were the tugs Warrior, Stormcock and Julia, as well as five trawlers and a lifeboat towed by a tug. These craft effected many rescues, picking up victims of the wreck as they found them in the water or lifeboats.

Oliver P. Barnard, a survivor, told a story which well illustrates the way in which the Marconi operators on the Lusitania acquitted themselves. Barnard made his way to the boat deck after the explosion, climbing up a ladder in order to reach what he thought would be the safest place in the foundering vessel. He encountered the operators in the wireless room and found them coolness personified. He learned from them, he said, that the explosion had put the main wireless set out of commission and that all the electric lights on the ship had been extinguished, leaving the Lusitania's inside compartments in complete darkness.

The vessel was listing heavily to starboard, but Leith and McCormick continued to send the S O S by means of the emergency apparatus. One of the operators took up a kneeling position on the deck, which was listing at an angle of thirty-five degrees, in order to take photographs of the sinking vessel. A sudden lurch of the ship spoiled his plan, however, and Barnard last saw him astride of a chair in which he said that he intended to "sit down and swim."

The British tank steamship Narragansett, bound from Liverpool to Bayonne, N. J., was thirty-four miles from the scene of the wreck when Marconi Operator Thomson Smith picked up the S O S from the Lusitania. The appeal was followed by the words "Big list. Come at once." Captain Charles Harwood, commander of the Narragansett, ordered the vessel to increase her speed and proceed to the rescue.



This photograph was taken by Operator McCormick as the Lusitania approached the Head of Kinsale. It shows the lifeboats of the vessel swung out in readiness for any emergency

She was nine miles from the Lusitania when a submarine appeared about 200 yards away from the tanker. A torpedo was fired but it passed astern of the Narragansett, missing her by about thirty feet. Captain Harwood then suspected that the S O S from the Lusitania was a hoax and made haste to steam out of the submarine zone.

The Leyland Line steamship Etonian also received the S O S from the Lusitania, being about forty-two miles

away from the sinking ship at the time. Captain Wood, her commander, said that soon afterward the steamship City of Exeter was sighted and then he caught sight of the periscope of a submarine between the two craft. He ordered full speed ahead and the submarine was outdistanced. No sooner had he eluded the under-water craft than another appeared and the Etonian was compelled to show her heels to the latter also. While the steamship was dodging the submarines she received a wireless message from the Narragansett, conveying a warning not to go to the rescue of the Lusitania.

Guglielmo Marconi said that the Lusitania had been chased by a submarine on her previous west-bound voyage when he was a passenger. Only a few persons were informed of the occurrence. The periscope of a submarine was sighted off Fastnet, near Cape Clear, on April 18, but the liner sped away before the under-water craft could get near enough to launch a torpedo at her.

Leith and McCormick boarded the Lusitania when she left England on her last voyage to New York. Operator W. C. Ryan had expected to be detailed as first operator, but he was replaced by Leith a short time before the vessel left. Both Leith and McCormick were in the service of the English Marconi Company, the former acting as traveling inspector. Leith was in the service for approximately eight years. McCormick has been in the service for about two years.

The Death of Operator Short in the Attack on the Gulflight

Other Occurrences of the European War in Which Wireless and Wireless Men Figured

CHARLES C. SHORT, Marconi operator on the American steamship Gulflight, and a number of the crew lost their lives when the vessel was damaged by an explosion on May 1st, off the Scilly Islands, as the result of an attack by a German submarine. Captain Gunter, the commander of the Gulflight, died of heart failure from shock.

The Gulflight left Port Arthur, Tex., on April 10th for Rouen, France, with a cargo of gasolene and oil. Short joined the vessel at New Orleans. It was his first voyage on the Gulflight.

Nothing out of the ordinary marked the early part of the voyage of the Gulflight. When about half way across the Atlantic, Short informed Chief Officer Smith that there was a British cruiser in the vicinity of the American ship. He said that he had been overhearing messages from the cruiser since the beginning of the Gulflight's voyage. The cruiser did not communicate directly with the Gulflight, but apparently kept at the same distance from the American ship until about three days before the latter reached the mouth of the English Channel.

The Gulflight spoke two British patrol vessels—the Iago and the Filey—about 11 o'clock in the morning of May 1st. Their commanders were informed that she was bound for Rouen, after which they were ordered to follow the patrol vessels to Bishop lighthouse. The Filey steamed along about half a mile off the port bow of the Gulflight and the Iago remained close off the American ship's starboard quarter. About an hour and a half afterward the second officer of the Gulflight sighted a submarine steam-

ing at right angles to the course of the American vessel. The submarine was in sight for about five minutes and submerged right ahead of the Gulflight. Those on the latter could not see any flag flying on the submarine.

The explosion occurred at about 10 minutes to 1 o'clock on the bluff of the starboard bow, hurling vast quantities of water high into the air. The survivors immediately lowered the boats and were taken on board the patrol vessels. The Gulflight was afterward towed to St. Mary's Roads.

Short, who was twenty-two years old, was a son of Mrs. Lottie E. Short, a widow, of 708 West 103rd street, Chicago. He was ambitious, even when he was a youth, to become a wireless operator, eventually enlisting in the signal corps of the United States army. He was sent to the Philippines and a short time after he came out of the army he obtained a detail on the Gulflight. He was the eldest of three sisters and two brothers.

A San Francisco newspaper says that William Sidney, a wireless operator who has been detailed in the station at Vladivostok since last December, arrived from China recently, on his way to his home in New York. He said that there are 25,000 German prisoners quartered just outside of Vladivostok and that 100,000 Russian soldiers were waiting for winter to break up so that they could take part in the fighting in the East. Snow three feet deep covered the entire territory, and supplies were stored for many miles around Vladivostok, awaiting the opening of the railroads.

A powerful wireless station is being built by Great Britain on the Highlands of the Island of Jamaica, 3,000 feet above the level of the sea, according to the Rev. George B. Stallworthy, a Unitarian clergyman who made a five months' visit to the island. The opinion prevails in the West Indies, he said, that Admiral Sir Christopher Craddock and his British fleet would not have been lost in the engagement with the German war vessels off Chili last November if there had been such a wireless station as is now planned in the service of the Allies in the West Indies. Defeat could have been avoided, it is believed, by warning the British admiral of the strength of the Germans by wireless or by sending other warships to aid him.

THE COLON RUNS ON A BAR

Reports received regarding the stranding of the steamship Colon, which recently arrived in San Francisco, show that wireless telegraphy was employed to good purpose in bringing aid. The Colon left San Francisco for Mexican ports on January 16 last and, after touching at Guaymas, steamed for Topolobampa. She became stranded on the bar off the latter port at twenty-five minutes after ten o'clock in the morning of February 4. W. R. Lindsay, Marconi operator, sent a distress signal which was answered by the U. S. S. Maryland, that vessel arriving at the scene of the wreck about six o'clock in the evening. The steamships Cetrianna and Korigan III also arrived late in the afternoon and the U. S. S. Annapolis appeared the next morning.

The passengers and crew of the Colon were transferred to the Maryland and Annapolis, Lindsay and the wireless set being taken aboard the Cetrianna. The apparatus was installed on the last-named vessel, enabling the commander of the Colon to communicate with the owners of the latter ship at their offices in San Francisco. The Colon was floated on February 10, and accordingly Lindsay removed the wireless set from the Cetrianna, reinstalling it on the former vessel.

SETS FOR LIGHTHOUSE TENDERS

Under the supervision of the United States Bureau of Standards wireless sets are being manufactured for the lighthouse tenders Columine, Cypress, Orchid, Sequoia and Manzanita. The range of the apparatus will vary from 300 to 100 miles.

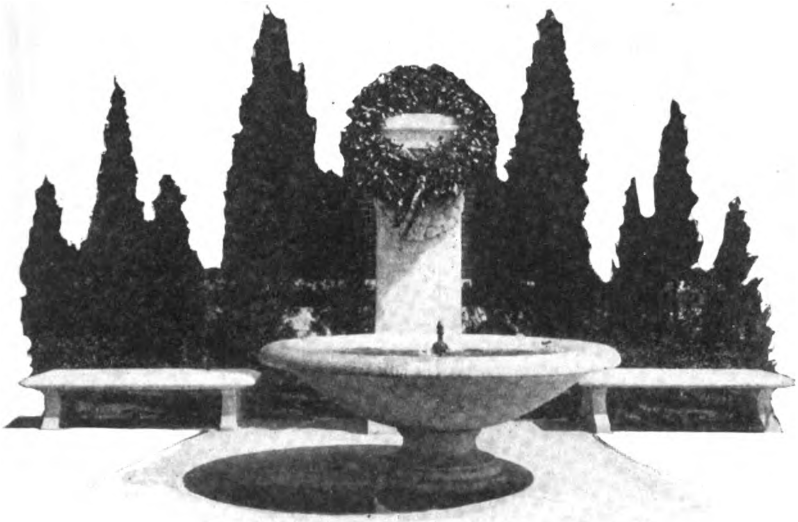
Wireless Heroes

From the Rochester (N. Y.) Evening Times

The wireless operators on the Lusitania . . . stuck to their posts until their outfit was dumb and rendered useless by the encroaching waters . . . the operator had left the room, but he dashed back and brought out a kodak. He knelt on the deck, listing at an angle of 35 degrees, and took a photograph. The assistant, a big cheerful chap, lugged out the operator's swivel chair and offered it to another, saying, with a laugh: "Take a seat and make yourself comfortable." He let go of the chair and it careened down the deck and over into the sea. The one who tells of the incident was washed into the waters and afterward picked up and saved. The wireless men went down with the ship.

This story of the heroism of the wireless operators is not an uncommon one in the history of recent great ocean disasters. It demonstrates what a high conception of duty men have, and how they respond to the call of humanity when the lives of others, including women and little children, are at stake. Following the line of duty their whole mission was to save. While there was a frenzy of fear and panic everywhere, with passengers and crew rushing here and there with the horror of impending doom upon them, these men calmly remained at their keys, sending out calls and hoping for an answer that would mean hope.

Under the waters of the ocean just a few moments before there were men who let loose the bomb which sent more than a thousand human beings into eternity. They were engaged in the business of war. And when, a little later, these wireless operators accepted the issues of war, it was theirs to lay down their lives in a supreme effort to save others. They were engaged in one of the ordinary occupations of peace. What a mighty contrast in motives!



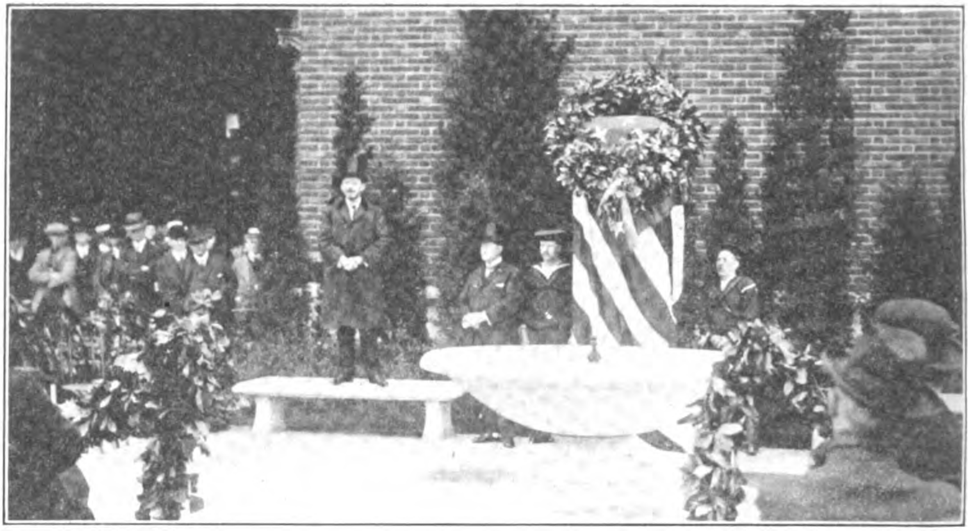
The Dedication of the Memorial Fountain

"IT is particularly fitting that monuments such as this should be dedicated here in Battery Park," said the Honorable George McAneny, "and I as the acting head of the New York City government, take pride in registering an official tribute to the memory of these brave men."

"TAPS"

Two uniformed man-o'-war's men who had been standing at attention, one at each side of the granite shaft erected "In Memory of Wireless Operators Lost at Sea at the Post of Duty," turned then, and lifting a huge wreath from the cenotaph, reverently put aside the American flag which draped it in voluminous folds. The plaintive notes of bugles sounded "taps"; a tiny sparrow fluttered down from the background of stately poplars and poised for an instant on the edge of the huge white basin; a whistle blew out in the bay and a patter of raindrops fell on the bowed heads of the assembled crowd. Thus was commemorated a new chapter in the imperishable annals of the sea, a lasting tribute to those who voluntarily accepted a tradition which will live as long as romance lives.

And because "most of us are creatures of the land, and the dangers of the sea have in our minds the added terror that attaches to things unknown and mysterious"—to quote the principal speaker at the unveiling on May 12—this simple and beautiful form of testimonial to manly courage and noble self-sacrifice in the face of tremendous odds will stand an elevating influence to the thousands which daily pass along the seawall of the great city which centers the maritime commerce of the world. At the extreme southern end of Battery Park, at the



Acting Mayor McAneny of New York accepting the memorial on behalf of the city

base of the Barge Office tower and against a screen of stately green cedars and poplars, the memorial to wireless operators marks the spot where New York's two great rivers of commerce join, carrying great ships steadily outward to the remorseless wastes of the sea.

Below and beside the garland, which, although of classic form, is composed of sea shells, sea weed and sea creatures, are the following inscriptions:

George C. Eccles, steamship Ohio, August 26th, 1909; Pacific Coast.

Stephen F. Sczepanck, steamship Pere Marquette, Car Ferry No. 18, September 9th, 1910; Lake Michigan.

Jack Philips, steamship Titanic, April 15th, 1912; Atlantic Coast.

Lawrence Prudhunt, steamship Rosecrans, January 17th, 1913; Pacific Coast.

Donald Campbell Perkins, steamship State of California, August 18th, 1913; Pacific Coast.

Clifton J. Fleming and Harry Fred Otto, steamship Francis H. Leggett, September 18th, 1914; Pacific Coast.

Ferdinand J. Kuehn, steamship Monroe, January 30th, 1914; Atlantic Coast.

Walter E. Reker, steamship Admiral Sampson, August 25th, 1914; Puget Sound.

Adolph J. Svenson, steamship Hanalei, November 23rd, 1914; Pacific Coast.

In the invocation Rev. Nehemiah Boynton, vice-president American Seamen's Friend Society, paid a fine tribute to the bravery which had governed the conduct of these men who had gone down with their ships and characterized them as cast in a mould different from those who go through life without having occasion to rise to an emergency that has its inevitable end in self-sacrificial death. His words had a powerful effect upon the assemblage gathered within the enclosure, for among those present were James Coffin Perkins, father of Donald Campbell Perkins, and Mr. and Mrs. Kuehn, whose son Ferdinand had contributed largely to the support of the little family. Present also were those whose ties had been the bond of friendship, the entire working force from the headquarters of the Marconi Company in New York being in attendance through an order which closed the company's offices for the occasion. There were also present many of the passengers who had voluntarily contributed to the memorial fund collected by operators on coastwise ships, as well as the officials of the Maritime Association of the Port of New York, in whose hands the administration of the fund had rested.

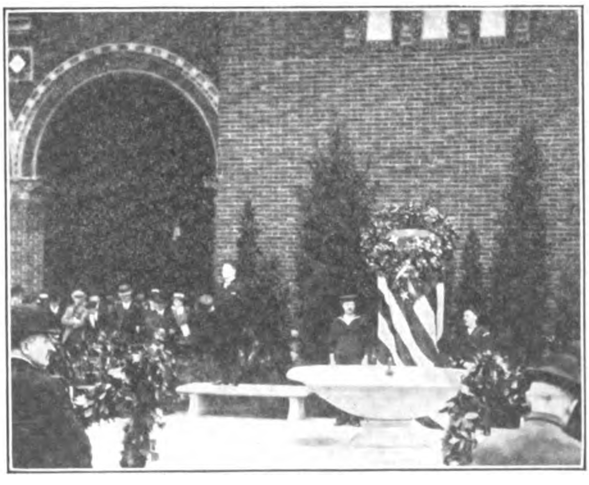
The monument, it will be remembered, has been erected by popular subscription and was conceived during the time when the world was recovering from the shock of the great tragedy of the Titanic. It was then proposed to call it the Philips Memorial, but subsequent developments broadened its scope and it stands today as a perpetuation of heroism equally great, if not so conspicuous. The first contribution came from the New York Times and amounted to $100; this was followed by one of $25 from Harold Bride, Philips' assistant on the Titanic, and $500 from the Marconi Company; the balance of the subscriptions were made by private individuals in small amounts. Under the direction of C. C. Galbraith the committee planned not only to erect a memorial, but to establish a permanent fund for the relief of the widows and families of wireless men who died in the performance of duty. A number of appropriations have been made from the accumulating fund of the past two years for such purposes, and when the expenses of the memorial shall have been paid in full, it is estimated that there will still be remaining about $1,400, which it is expected will be utilized for some such relief work.

In the course of the unveiling ceremonies many references were made to the humanitarian aspects of wireless telegraphy. Acting Mayor McAneny called attention to the fact that when the wireless telegraph was first invented we looked upon it as a great boon to commerce and, of course, as an additional safeguard to human life on the sea. But few of us, he contended, saw to what extent it offered an opportunity for a new and peculiarly appealing kind of heroism. He expressed the gratitude of the assemblage that there should have been spared, and was present, Jack Binns, the hero of the first spectacular instance which called our attention to these values.

Eulogizing those less fortunate whose names have been inscribed on the shaft, he termed the blank space remaining "a melancholy reminder that perhaps other names will have to be added."

"The picture we form of a man on a sinking vessel, sitting calmly at his post ticking off the calls for help—calls which may or may not be answered—stirs our deepest admiration," said Mr. McAneny. "Could any sort of courage and sacrifice be more impressive than that of Jack Philips and the coolness with which he stuck to his post on the Titanic on that awful spring morning in mid-Atlantic, three years ago? It was a story that went round the world and won for this monument the respect and gratitude of millions. It is indeed fitting that the gentlemen of the Maritime Association should perpetuate the names of Philips and other wireless heroes in lasting granite, for in the rush of our affairs we are all too prone to forget the great deeds they performed. And, though we remember Philips most clearly because of the extent of the disaster in which he figured, we should not forget the other nine operators who are just as deserving of immortality."

Park Commissioner H. Cabot Ward, upon whom rests the responsibility of keeping the monument for the public, pledged the resources of his department to the end that the task would not remain a duty, but an honor. Accepting the key which turned on the water from William Lawrence Bottomley, of the firm of Hewitt & Bottomley, architects, whose design had been presented gratuitously and selected after a competition, the



Commodore Fred B. Dalzell of the Maritime Association reviewing the events which led to the memorial's erection

Commissioner coupled the new class of heroes with those set apart by their association with a new invention. "But these wireless heroes are not in fact separated in any way from all the world heroes. It is a wonderful quality of the human soul that new conditions always bring new manifestations of heroism," he said.

The monument stood for the progress of the world, Mr. Ward believed, showing conclusively that the complex conditions of modern society have not spoiled us. Each form of danger had brought its corresponding heroism, and so humanity steadily climbs up in the scale of civilization. He characterized as inspiring the thought that the inscriptions on the granite shaft reminded each passer-by that in every tragic incident which thrills the world, men in all walks of life, to whom life is most dear, give it up most cheerfully and face death as a "beautiful adventure." The mere sight of the memorial, he believed, should inspire consideration for others, for sacrifice, for unselfishness, for devotion to duty, for moral courage in daily life.

Commodore Fred B. Dalzell then introduced the Rev. Raymond Meagher, O. P., who pronounced the benediction.

In commemorating the glorious deeds which the memorial perpetuated, he said we were awakening a new realization of the meaning of fidelity and heroism; by reason of the stirring events of the immediate past, the present circumstances of our nation, of our international difficulties and the almost war-like aspect of our relations with foreign nations, the occasion was most important and significant. "Mark where we stand," he declared in ringing tones. "It is in view of a mass of uplifted stone, in the presence of a small number of wireless operators; and yet from that cold stone, from these unostentatious personalities there arises a mystic potency which bears the mind over the whole world, up and down the broad Atlantic and the Pacific, from the Arctics to the Tropics; and everywhere with a sense of personal concern we come across the numerous kindred of those whose memory we honor, some sleeping the sleep from which no

Rev. Raymond Meagher, O.P., pronouncing the benediction and saying: "The recollection of the wireless operators whose monument we have unveiled is a benediction which makes us recognize our inability to appreciate the sublime heights and the immeasurable capacity that poor human nature can be raised to"

earthly morning call will rouse them, others living useful, energetic, scientific lives, whose names indeed are not all emblazoned on this scroll of the great and mighty, but who again and again have gone through the highest test of fidelity to duty for their fellow man. By that same mystic power what a flood of memory comes o'er the mind!—of sorrow not forgotten but consecrated in its sublimity; of heroic men who by their sacrifices preserved our faith in humanity and its brotherhood; of deeds of unheard-of valor and heroism which made glorious the pages of history."

That the deeds commemorated by the memorial would quicken the capacity of Americans in the service of humanity was noted in the observation that, in admiring the heroism of the chosen few whose great deeds make them commanding figures of history, our own motives are changed for the performance of duties more humble.

"Today in the person of Marconi we extol science because science is truth," was the thought he gave to man's greatest benefactor. "We now admire the potency of scientific achievements, the unfolding facts of which are accepted, but whose miracles yet in their infancy

Jack Binns, the hero of the Republic disaster

The unveiling by United States sailors

direct us to the infinite and eternal. To consecrate oneself to scientific achievements, where service is demanded and where one must freely and continuously hold out his very life with every supreme effort of which he is capable—and that until the very last moment when service is possible—should elicit from us all the wealth of commendation that human gratitude can accumulate and bestow. The recollection of the wireless operators whose monument we have unveiled is a benediction which makes us recognize our inability to appreciate the sublime heights and the immeasurable capacity that poor human nature can be raised to and developed by an all-wise Providence.

"In the history of humanity no crisis has been above the heroes and the heroines God has raised up. These heroes and martyrs made their posts of duty sacrificial altars where they were at once the victims of holocausts, and the officiating ministers. Eternal rest is theirs. Shall we doubt it? Shall I, a priest of Him who said 'Greater love than this no man hath, that he lay down his life for his fellow man,' doubt for one instant that the well-merited reward of eternal happiness was given to each and every one of them? We read of the martyrs of old, the martyrs of the colosseum and the arena, and we fondly and truly believe that by that one supreme act of

self-sacrifice, of public profession of faith, the imperfections of their life were wiped away and straightforth they entered into the companionship of Him for whom they so bravely and willingly shed their blood. Shall we doubt that these our heroes, who so freely and fearlessly gave up their lives that their fellow men might live, receive the same reward? Martyrs they were to their calling and their duty, martyrs under the most extraordinary and trying circumstances. Martyrs worthy of the highest praise and reward.

"If there is one point on which I would insist, it is that the heroism which these heroes exhibited in the hour ot need was not the fortuitous outcome of an accidental occasion. These men were heroes at heart, the foundation of their great courage was well laid long before the emergency demanded its manifestation! It is possible that a man may raise himself above the weaknesses and deficiencies of his character by some extraordinary incentive, but this is accidental and seldom happens. Ah, no! They came from the rank and file of those loyal followers of Marconi, the love of their profession in their hearts, the spirit of America in their blood, the love of God and their fellow men in their motives. And it is this fact that brings us to the great consolation of knowing that what these dead heroes have done in their great hour of trial will be again enacted by their loyal successors when the hour of imminent distress and call to duty shall be theirs."

The wireless operators in the assemblage were reminded of the great heritage which was theirs, the still greater opportunities. They were told that, faithful to the example of the honored heroes and co-members, they were the inspiration of fidelity and heroism—the consolation of the families of those who embark on the ocean, for these people counted on their devotion and felt secure in the knowledge that whatever evil befall the operator would give the aid necessary. Wireless men as a class were pointed out a living sermon, a force of proselytism, the spectacle of heroic devotion enforcing esteem and respect for the faith which it inspired.

It was added:

"Let us rejoice that such noble souls have lived. May we be grateful for our own privilege of admiring and receiving the benediction of their lives. Their deaths have exploded forces that will not spend themselves until the end of time: forces that will encourage and stimulate and chasten and spiritualize their fellow men throughout the ages.

"May the God of Justice reward their splendid deeds of heroism with the crown of martyrdom.

"May the God of Omniscience enlarge our vision and enfold our gratitude.

"May the God of Mercy in His infinite generosity allow their kinsfolk and their countrymen, and citizens of the whole world to be led to paths of higher, nobler lives by the constancy, the example and the sacrifices of the faithful ones whose last distress message brought life to many, but death to themselves."

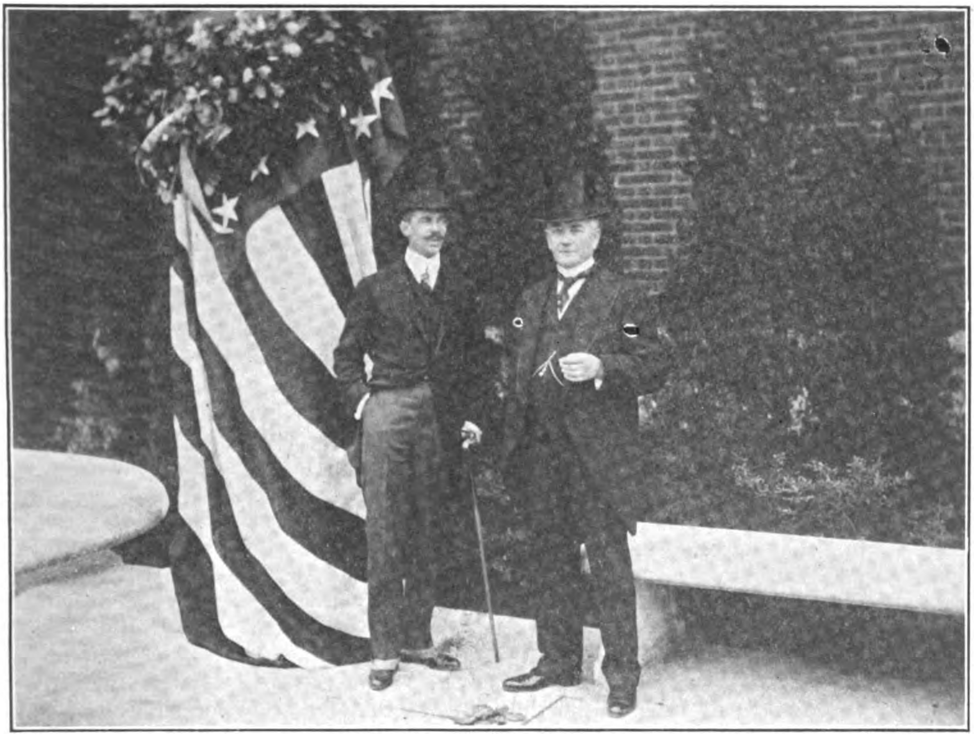
The details of how these men met their end in their devotion to duty are familiar to many of the readers of The Wireless Age, for the great ocean tragedies in which they figured are mainly of recent date.

The first to die was George Eccles, who stood by his wireless instruments until they were silenced when the hungry sea pounded to pieces the steamship Ohio on an Alaskan reef on August 26, 1909. It had been known from the time she struck that the ship was doomed. In the midst of the excitement of getting the passengers off, Eccles raised an Alaskan land station and with its aid located the Humboldt and the Ruppert City, two fast vessels which were fortunately near by and headed directly toward the sinking Ohio.

The vessel sank within thirty minutes after she struck; ten minutes before the end the rising waters flooded the engine room and made the wireless instruments useless. Eccles appeared on deck, only to discover that the last of the lifeboats had gone. The rescue vessels were then in sight and it seemed certain that he would be saved. But before aid could reach him a mountainous wave lifted the Ohio from the reef and crashed her down on the jagged rocks. Instantly she disappeared beneath the waves and Eccles was seen no more.

Stephen S. Szcpanck was lost less than

ten years ago on Lake Michigan under very unusual conditions. Car Ferry No. 18, to which he was assigned, was carrying a long train filled with passengers between Ludington, Mich., and Milwaukee, a distance of a little more than 100 miles. The lake was without a ripple and the ferry boat had arrived within twenty-nine miles of the Wisconsin side when it struck a rock. Szcpanck had just informed Milwaukee by wireless that they were approaching port when the captain rushed in and directed him to send out the distress call. The signal was immediately picked up by several posts in the vicinity, including a sister ferry boat, No. 17.



William Lawrence Bottomley, designer of the memorial, and Charles C. Galbraith, under whose direction the fund for its erection was secured through popular subscription

The vessel received a mortal blow and filled rapidly. The passengers in the comfortable railroad coaches could scarcely realize their danger. Never was a shipwreck under such circumstances. When the passengers stepped from the coaches they found the decks already awash. Throughout the excitement Szcpanck remained in the wireless room sending out the call for help. When assurances of rescue had been given he passed through the train, stopping at every seat to assure the passengers that aid was coming. When he had done all in his power to aid in placing them in the small boats and sending them away in good order, there remained on the ferryboat only four men, three officers and the wireless operator. Szcpanck returned to the wireless room and was seen no more. When the rescue vessels arrived the ferryboat had disappeared and with it the men who had stuck to their posts of duty.

In the great Titanic disaster of April 15, 1912, it will be remembered that Jack Philips was worn out physicaly from seven hours' unremitting toil in effecting some needed repairs on the preceding day. His assistant had come to relieve him before the hour of midnight, when

his watch regularly ended, and thus was standing beside him when the great leviathan crashed into the iceberg. The great weight of the ship deadened the blow and no one realized the danger when a few minutes later the captain came to the door and suggested that Philips prepare to send out a call for assistance. Ten minutes later the suggestion became an order and Philips' crackling key broadcasted the S O S call. Several ships were picked up, including the Carpathia. Philips continued at the key, sending with a steady hand. The confusion on deck meanwhile was rapidly increasing. The ship had sunk perceptibly at the head and the decks were already awash when the captain returned and ordered the wireless man to abandon the ship. For fully ten minutes more Philips held on, sending out directions to the relief vessels. When he finally left his instrument the last of the lifeboats had gone and it is believed that he remained on board until the final plunge.

He was later rescued from the icy waters by one of the crowded lifeboats, but when with the dawn the Carpathia arrived, it was found that he had died during the night from exposure.

Lawrence A. Prudhunt was but eighteen years old when the Rosecrans was wrecked on the Pacific on January 7, 1913. The Rosecrans carried no passengers and of the thirty-six forming the crew only three were saved. While the crew were busy with the boats Prudhunt remained in the wireless cabin sending out the call for help. He was offered his chance in the boats, but he stayed by his post of duty until the ship broke up beneath him. When the rescuers sought him they found that he had been pinned under the wreckage of the wireless house and washed overboard.

Trapped in his wireless cabin, too, was Donald Campbell Perkins when the State of California sank beneath the waves three minutes after she struck a reef in Gambier Bay, Alaska, August 18, 1913. Perkins was asleep when the crash came. He rushed into the wireless room in his pajamas. While everyone else was struggling for the boats his first thought was to reach his instrument. The inrush of water put the main set out of commission and Perkins coolly adjusted the auxiliary apparatus. His call was answered by the steamship Jefferson, which immediately speeded to the rescue. Knowing that every minute's delay lessened his chance of escape, Perkins continued to communicate with the Jefferson, giving the exact position and other information. Out on the deck excellent use was made by the crew of the few moments left them for getting the boats overboard. Suddenly the vessel listed to port and the lifeboats immediately in front of the wireless cabin broke adrift and jammed fast in the door, holding Perkins a prisoner. A moment later he went down with the ship.

One of the most recent of the sea tragedies occurred with the sinking of the Monroe on January 30, 1914. The wireless operator, Ferdinand J. Kuehn, was a New York boy, only twenty years of age. The Monroe, which plied between New York and Norfolk, sank within twelve minutes after a collision in the fog off the Virginia coast. Knowing that the ship had received her death blow and could remain afloat but a few minutes, Kuehn's assistant brought a life preserver to the wireless room and helped the operator to adjust it. Meanwhile the crew had succeeded in getting three boats away and the order to save women and children first was being rigidly obeyed. Kuehn was induced to go on deck only at the last moment, when it was known that the ship was sinking. As he stood there a woman passenger came toward him and he noticed she had no life preserver. He unfastened his own and insisted that the woman accept it. Then he helped her into a lifeboat. A few moments later the survivors saw him slip on the tilted deck and fall into the water. He was not again seen.

Walter E. Reker was the wireless man on the Admiral Sampson which sank after collision with the Princess Victoria of Seattle, Washington, April 25, 1914. The Admiral Sampson was feeling her way along the coast in a dense fog when the crash occurred. A twelve-foot hole was stove in her bow. To add to the horror of the situation the oil cargo she carried was ignited and the flames quickly spread throughout the ship. Through the bravery and effici-

ency of the crew all but two of the fifty-four passengers were saved. Reker might readily have saved himself by taking to the boats with the passengers and the greater part of the crew. The Princess Victoria had explained by wireless that she was sending for assistance and there was no need for the Admiral Sampson's man to operate his instrument longer. But Reker had found work on deck to do and devoted himself to assisting the passengers adjust their life-belts and reach the boats. He ignored repeated appeals to save himself. When the last boat had left safely, Reker reported to the bridge and remained to share the fate of the captain. He was on the bridge with his superior officer when the ship went down.

Clifton J. Fleming was the youngest of the wireless heroes, only seventeen years old. With Harry F. Otto, his assistant, he was lost in the wreck of the Francis H. Leggett off the Oregon coast on September 18, 1914. The steamer, carrying a large passenger list, was bound from Portland to San Francisco. She had been laboring in heavy seas for two days and was greatly weakened by the pounding of the waves when the cargo suddenly shifted, giving her a permanent list. The sea broke over her and the hatch was wrenched off; through the opening the water poured in great volume. Several boats were launched, but foundered as soon as they struck the water. The wireless men remained at the instruments and succeeded in securing help even as the seas were passing completely over the cabin.

Otto went down with the suction of the ship. Fleming got away safely and it is believed that he would have been saved but for his heroism in giving his chance of life to one of the women passengers. He had just assisted a man to a floating piece of wreckage when a woman was swept against him. Having aided her to grip a floating railroad tie and assured himself of her safety, he remarked that the lumber was not large enough to support them both and deliberately let go and sank.

A full account of the wreck of the Hanalei, in which Adolph J. Svenson perished, was given in the January issue of THE WIRELESS AGE. It was on the morning of November 23, 1914, that the Hanalei grounded on Duxbury reef, fifteen miles north of San Francisco. The senior operator, Loren A. Lovejoy, who was saved, under instructions from the captain directed Svenson to send out a distress call. The signals were picked up by the Marconi trans-oceanic station at Bolinas, the San Francisco station, a revenue cutter and a merchantman. The rising waters put out the dynamos and made useless the storage batteries of auxiliary set. The ship then lurched suddenly, leaving the storage batteries clear of water. Lovejoy sent another call for urgent rescue. A moment later the wireless cabin was swept overboard. Rising to meet the emergency, a flash lamp was employed and the work of rescue directed to the shore by means of dots and dashes of the code made by the light. With the arrival of the flood tide, when the ship broke in pieces, this communication was still in use. Lovejoy said that he last saw Svenson soon after the ship broke to pieces clinging to a piece of the hull. Of Svenson he said: "Throughout our terrible experience he remained cool and resourceful, upholding in an exemplary manner the traditions of the Marconi service."

And this, as may be seen, is a fitting epitaph for all those whose names have been inscribed on the shaft of the memorial fountain.

SIR JOHN CAMERON LAMB DEAD

Sir John Cameron Lamb, who was the senior British delegate at the first International Conference on Wireless Telegraphy held in Berlin in 1903 died on March 30. He was a member, for five years, of the Royal Commission appointed to consider the establishment of electrical communication with lighthouses and lightships. He was formerly second secretary of the Post Office.

Admiral Sir Henry Jackson, who has been appointed First Sea Lord of the British Admiralty to succeed Admiral Lord Fisher, is known for his work in connection with the introduction and development of wireless telegraphy in the navy.

How to Conduct a Radio Club

By E. E. Bucher

ARTICLE XIV

THE experimenter ambitious to become a full-fledged amateur may have had his interest aroused by a visit to a wireless station or by reading an article on radio telegraphy. In either case he realizes that it will be necessary to take certain steps before he will be able to send and receive messages. What these steps are he perhaps does not know. It was to meet the needs of this class of prospective amateurs that this article was written.

Preliminary Education

The beginner in the field of amateur wireless telegraphy should first become conversant with the general restrictions imposed upon the amateur by United States legislation. He should purchase from the Government Printing Office, Washington, D. C., a booklet entitled "Radio Communication Laws of the United States and the International Radio Telegraphic Convention." The price is 15c. per copy.

This publication gives full information as to the regulations governing wireless operators and the use of radio telegraphic apparatus on ships and land. The experimenter should refer first specifically to page 55, paragraphs 63, 64, 65, 66, relative to amateur station licenses, etc.

From these he learns that when specially qualified and having had at least two years of experience, the amateur may, in certain districts, secure a special license for an exceptional station. Such experimenters, of course, belong to a class which he cannot immediately join.

In paragraph 65, he finds that general amateur stations are restricted in transmission to a wave-length of 200 meters, which, to the uneducated, means that further knowledge of the principles of wireless telegraphy must be obtained.

In paragraph 66, he finds that if his station is located within 5 miles of a naval station, the wave-length for transmitting purposes is limited to 200 meters and the energy consumption at the power transformer to 1/2 k.w. This station is said to be in the "restricted" class.

He learns that "general" or "restricted" amateur stations must be in charge of an operator having an amateur's first grade or amateur second grade operator's certificate, who will be held responsible for its operation in accordance with the United States regulations.

He learns that the station must always be under the supervision of a licensed man. Moreover he finds that for a simple receiving station no license whatsoever is required. Again, provisional licenses are issued to amateurs far remote from radio inspectors. If, after actual inspection, such stations are found to fully comply with the law, the term "provisional" is struck out and the station is indicated as having been inspected. Amateur station licenses and amateur operators' licenses hold good for a period of two years, whereupon they may be renewed.

Requirements for Amateur Licenses

In order to secure an amateur first grade license certificate the applicant must be familiar with the adjustment and operation of wireless telegraph apparatus. He must also be familiar with the rules of the International Radio Telegraphic Conventions, particularly the regulations concerning the requirements in regard to interference. He must be able to transmit and receive at a speed sufficient to recognize distress or "Keep out" signals. A speed of 5 words per minute is generally considered sufficient for the requirements. The writer recommends that the amateur wait until he has attained a speed of 10 words per minute before attempting to take the examination.

For an amateur second grade certificate the requirements are similar to those for a first grade certificate, except that these licenses are issued to an applicant who cannot be examined. If amateurs, for valid reasons, cannot appear in person and are able to convince and satisfy the government authorities as to their knowledge on the subject, a license of this kind may be issued. No fees are required for either an operator's license or an amateur station license.

It is obvious that the prospective amateur is not yet qualified to enter into negotiations with the government authorities; in fact, he must take a number of stage of development and will send to him for hours at a time.

As far as sending is concerned, to learn the formation of the characters of the telegraphic code is not a difficult task and may be accomplished single-handed in a very short time, but to recognize the characters of the code as sent out by another is somewhat more laborious. The beginner in wireless does not, however, need to wait until he becomes a high-speed telegrapher to enter the amateur's realm; when he attains proficiency at a speed of 10 words per minute, he is quite eligible for a place in their sanctum sanctorum.

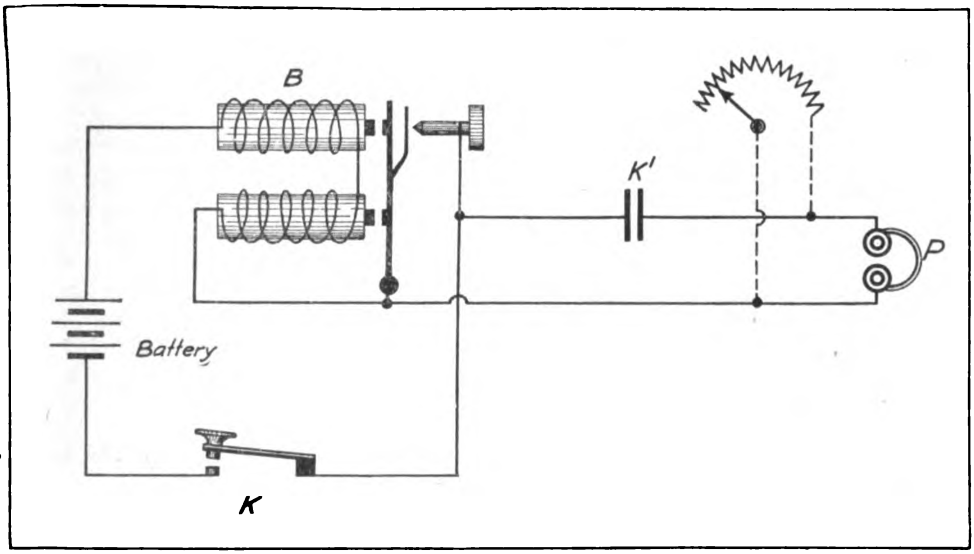


Fig. 1

preliminary steps, particularly from a technical and operating standpoint, which will be mentioned.

It is self-evident that the amateur who cannot interpret the signals of the International Continental telegraph code loses 99 per cent. of the total enjoyment to be derived from operating a set. In fact, unless he attains this degree of proficiency, the apparatus becomes a useless toy and attempts at communication with his friends—even if allowed—will result in hopeless bungling.

It is in order, therefore, for him to begin immediately the practice of the telegraphic code. This he cannot do alone. He will require assistance from an amateur friend who has already passed this

He now desires to purchase a receiving apparatus, but before going into the details we shall describe a simple buzzer system which may be used to advantage in practice of the telegraph code (Fig. 1.) A simple bell buzzer, B, is energized by a 4-volt dry cell battery in series with which is connected the signalling key, K.

Across the contact of the vibrator is shunted the head telephone, P (of 75 ohms resistance), in series with the condenser, K.

The condenser, K, may be of almost any capacity desired, but is preferably not less than .01 microfarads capacity. It may be necessary to shunt a resist-

ance across the telephone, P, to reduce the volume of sound. The receiver, P, is donned by the learner, the sender transmitting on the key, K. If the buzzer is properly adjusted it will give a perfect reproduction of wireless signals.

An Amateur's Simple Receiving Equipment

The beginner should not attempt the more elaborate fields of experiment until he has become skilled in the simple methods. Having become proficient in the code he should erect a receiving equipment of elementary design and simplicity. A license is not required for receiving purposes and accordingly the receiving aerial may be, within reasonable limits, of any dimensions desired. Here, again, the experimenter must be guided by a sense of the fitness of things. He, therefore, requires an elementary knowledge of the fundamentals of wireless telegraphy which he can obtain from books and periodicals on the subject.

It is also essential that the beginner should acquire knowledge of the elements of electricity and magnetism if he wishes to operate his instruments comprehensively. Some naturally possess this knowledge, while to others it is a matter of attainment. One thing is certain—by slight application such knowledge can be easily gained.

In the study of the elements of electricity the author recommends that the beginner immediately learn the difference between alternating current and direct current. He should familiarize himself with the general conditions under which such currents are handled, learning to know when a circuit is overloaded and the size of fuses to be installed to carry a given amount of current.

He should also make a thorough study of the underwriters' rules in reference to the insulation of power circuits, paying particular attention to the rules which relate to the installation of wireless telegraph apparatus. The underwriter's rules vary in different cities, but a copy of them may easily be obtained for reference. The prospective amateur should also learn the current-carrying capacity of various sizes of wires, thereby making sure that the circuits at his station will not become overheated.

The writer has no particular recommendations to make regarding books on electricity and magnetism. The majority of these works are of value and should be studied carefully.

Summing up the foregoing, it will be seen that the experimenter has prepared himself for the amateur field in three respects:

1. He knows the radio laws which he should obey.

2. He is able to telegraph at a fair speed and is, therefore, qualified to interpret wireless signals.

3. He understands the elementary principles of electricity, and also the fundamentals of radio telegraphy.

He is now fully qualified to embark on his initial experiments and should begin with a simple receiving equipment. For this work the author recommends the simple two-slide tuner connected up as per Fig. 2.

An Elementary Receiving Set

The complete equipment comprises a single-two-wire aerial about 100 feet in length, a two-slide tuning coil, AB, having the sliders S1 and S2, a silicon detector, D, a small fixed condenser, C, and a high resistance telephone, P. The writer does not recommend receivers of less than 1,000 ohms resistance, because telephones of lower value are generally found unsatisfactory and unreliable with the crystalline detectors.

Should the experimenter desire to construct this tuning coil, the following dimensions are recommended: the coil is to be 8 inches in length by 3 inches in diameter and wound closely with a single layer of No. 28 S. S. C. wire.

The slider, S1, enables the wave-length of the antenna circuit to be altered while corresponding adjustments in the receiving circuit are obtained at S2. With a receiving set of this type the learner will become a keen observer of the manner in which commercial and amateur wireless telegraph traffic is handled, thus obtaining a preliminary education which cannot be equalled. Furthermore, a simple receiving set, as per Fig. 2, will give a reasonable degree of efficiency.

Returning to the subject of receiving aerials, the question is invariably asked: "How long shall it be and what is its receiving range?"

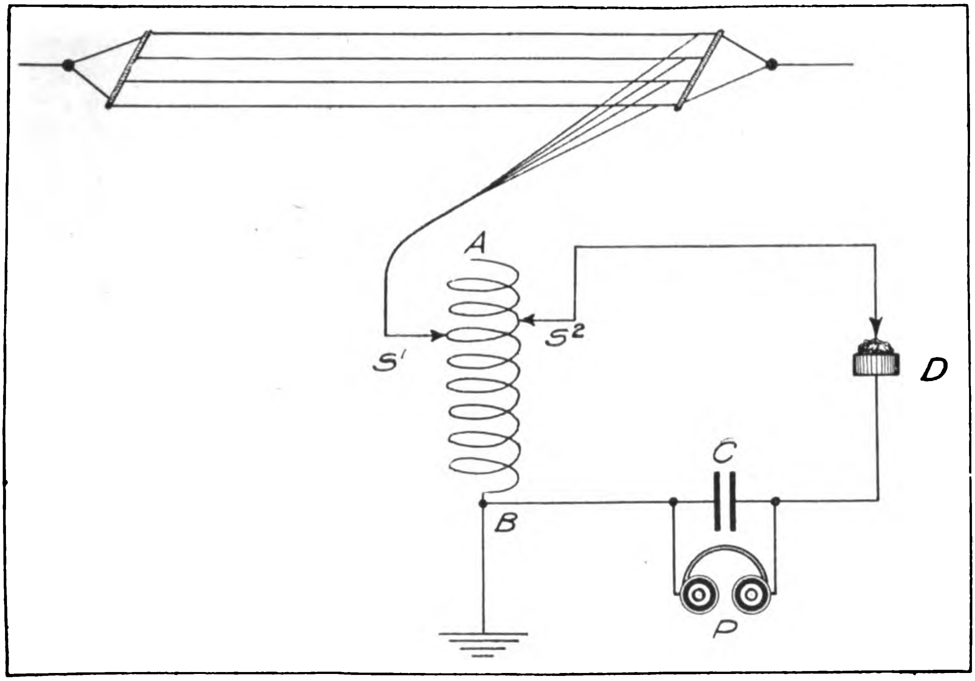


Fig. 2

Now, the actual length of a receiving aerial is probably first gauged by the space available, and second by the wave-lengths and power of the stations from which it is desired to receive. It is best to begin experiments with a receiving aerial suited strictly to the wave-lengths of amateur stations, namely, 200 meters. Later a more elaborate equipment and apparatus may be installed as the learner's knowledge of the subject increases.

The question as to the number of wires to be included in the aerial has been much discussed, but as it is understood today there seems to be little advantage in the erection of a receiving aerial having more than two wires. An aerial comprising from two to four wires, 50 feet in height, by 40 feet in length, with the wires spaced two feet apart, will have a natural wave-length of about 160 meters which is of the correct dimensions to be loaded to a wave-length of 200 meters. Of course, this aerial may be employed for the reception of longer wave-lengths, say up to 3,000 meters, but it will give better results from stations having wave-lengths between 200 and 700 meters.

An aerial having a natural wave-length of 600 meters, however, is altogether too long for the reception of signals from amateur stations working on a wave-length of 200 meters. In any event, for the purpose stated, the aerial should not be more than 100 feet in length.

Having progressed so far in his wireless education, the student should devote himself diligently to the use of the receiving apparatus, familiarizing himself with the methods of communication employed by amateurs at large. Many amateurs are accustomed to use abbreviations in ordinary conversation for the simple words, as per the Phillips telegraph code, and the beginner should learn some of those commonly brought into practice.

It is assumed that he has practiced transmitting regularly on the buzzer set previously described. When he is confident that he is capable of sending without causing undue interference he should purchase a simple transmitting outfit. If his station is located so that the signals will carry beyond the borders of the state in which he resides, a license must be secured. If it is definitely known that

the signals will not carry this distance, a station license is not required. The experimenter should fully satisfy himself regarding this matter by communicating with the radio inspector in his district, giving a complete description of his station and requesting advice as to its probable wave-length and carrying range.

It is somewhat difficult to estimate the range of a transmitting set on account of the variable factors entering into the case. The range is dependent upon:

1. The height and dimensions of the transmitting aerial.
2. The nature of the earth connection.
3. The closeness of energy-absorbing conductors, such as trees, smokestacks, steel buildings, bridges, etc.
4. The character, efficiency and power of the transmitting apparatus.
5. The type of receiving apparatus employed at the receiving station and the skill with which it is handled.

With the average amateur transmitting aerial, taking into account the receiving apparatus generaly employed, a 1 inch spark coil as a transmitting apparatus will give a range of not more than five or six miles. A 2 inch spark coil will cover about ten miles, while a 3 inch spark coil may be relied upon for fair communication at a distance of from fourteen to twenty miles.

Stations fitted with a ¼ k.w. alternating current transformer may be expected to have a range of about 30 miles, while those with a 1 k.w. transformer should do from 40 to 50 miles under favorable conditions. The writer is well aware that in certain cases greater distances are covered by many amateurs, but these are accomplished under extremely favorable conditions (in a clear, open country) with a receiving apparatus of the supersensitive type.

The large commercial companies are in possession of data regarding the aerials of more uniform type which enable them to forecast the range of a given transmitting set quite accurately.

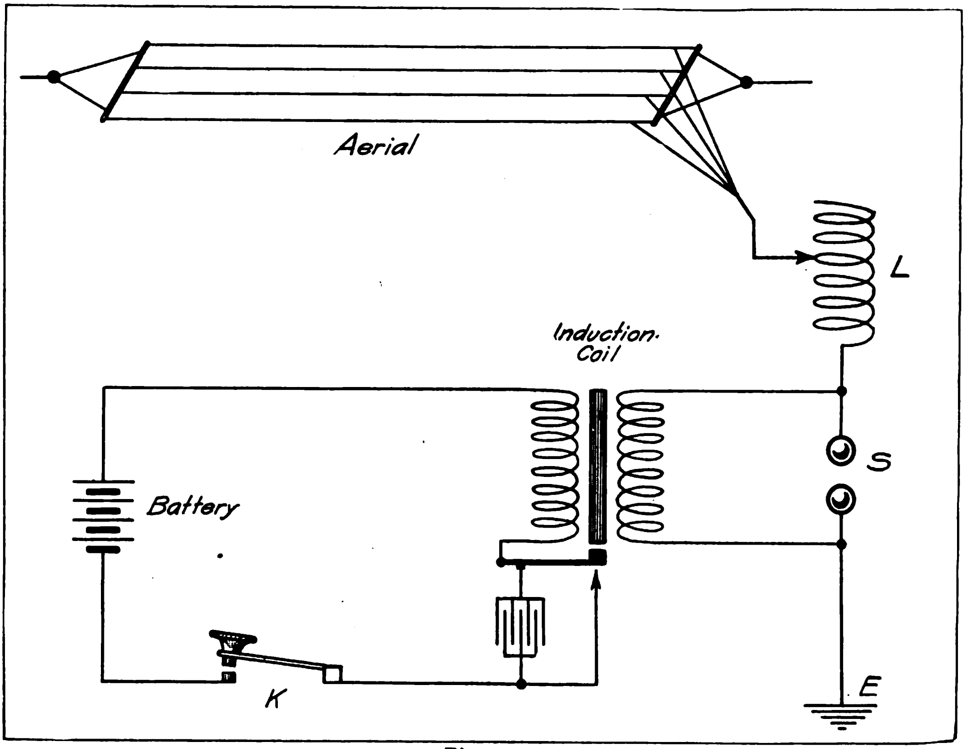


Fig. 3

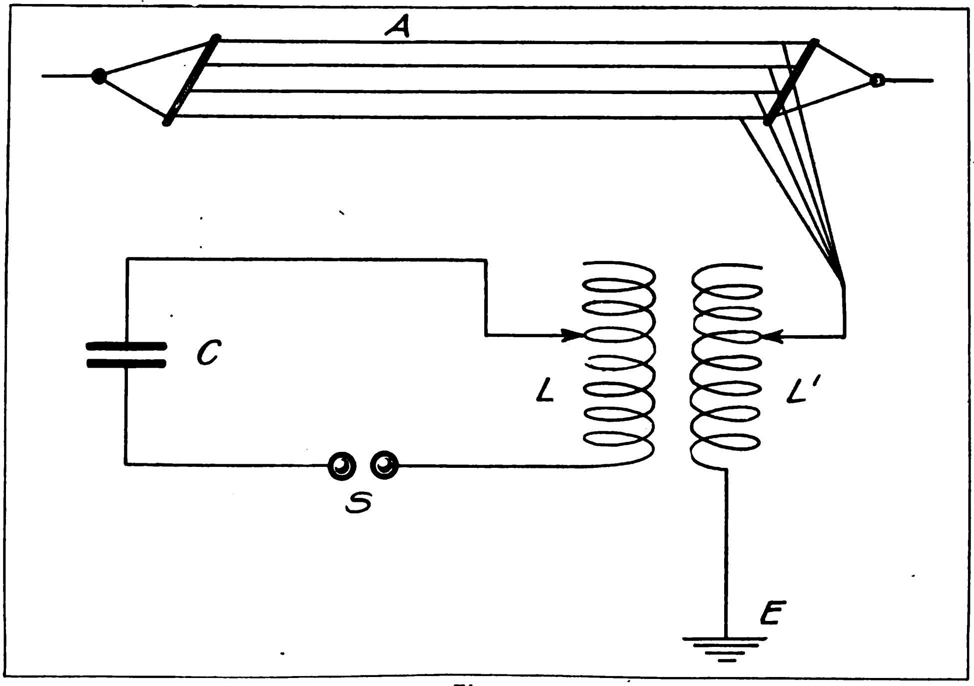


Fig. 4

For the beginner the author recommends the simple transmitting set indicated in Fig. 3. The aerial, AB, having a natural wave-length of about 160 meters, has connected in series with it the tuning coil, L, and the spark gap, S. The spark gap, S, is connected to the secondary terminals of an induction coil having a normal spark discharge of from 1 to 3 inches. The primary winding of the coil is energized by from 6 to 10 volts of storage battery, the cell having preferably a capacity of 60 ampere hours.

The spark discharge points at S should not be more than 3/16 inch in diameter, and may be of zinc or brass. They should be carefully regulated during operation until the discharge is free and clear from flame. As turns of wire are added or subtracted at the coil, L, the wave-length of the aerial system is increased or decreased. Thus, if interference is experienced on one wave-length another number of turns may be selected giving a different wave-length. It should be understood that the United States authorities will not allow a transmitting set of this type to be operated within the zone of interference, because of the fact that the emitted wave is apt to be very "broad" (high decrement). This statement, however, is only correct when the antenna circuit includes no localized inductance such as at the coil, L. The effect of the coil, L, is to sharpen the emitted wave, thereby causing less interference.

An amateur wireless telegraph station is said to be within the zone of interference when it is so closely located to a commercial or naval station that the operation of these stations is apt to be interfered with.

In order to emit a wave of greater purity, an oscillation transformer must be used and connected, as in Fig. 4.

Transmitting Set of the more Advanced Type

The progressive student soon passes the spark coil stage of development and becomes ambitious to acquire a more elaborate and effective equipment in order to place himself on a par with the more experienced amateurs in his vicinity. He, therefore, purchases a high potential transformer, a large high potential oil condenser, an oscillation transformer and rotary spark gap. The

author suggests in the case of the plain spark gap discharger, if the set is to be operated on 60 cycles, that the capacity of the transformer be limited to 1/4 k.w.; with the rotary spark gap it may be of the 1/2 k.w. size.

Returning to the matter of the oscillation transformer, we refer to Fig. 4. Here the coil L, is arranged so that it can be placed inside of L′ or drawn away from it to any distance desired. The coils, L and L′, are high potential coils consisting of a very few turns of heavy copper tubing or stranded insulated wire, the turns being well insulated from each other and of suitable current-carrying capacity. In previous issues of The Wireless Age, a number of oscillation transformers of suitable construction for amateur work have been fully described.

When the coil, L, (Fig. 4) is drawn at a suitable distance from L′ a pure wave will be emitted from the antenna which will tune "sharp" at the distant receiving station. When the coil, L, is directly inside of L′ a complex wave is emitted which tunes "broadly," causing considerable interference. The actual position of the two coils for a non-interfering wave is determined by means of a wave-meter. It is plain that the oscillation transformer allows the character of the emitted wave to be definitely controlled in compliance with the restrictions. The high potential condenser of the set shown in Fig. 4 is preferably excited by an alternating current transformer rather than a spark coil, although the spark coils of the larger size may be employed.

The transmitting station just described cannot be put into operation until a station license is secured. And a station license cannot be obtained until the owner or other responsible party possesses a first or second grade amateur operating license.

The amateur must then proceed to one of the United States examining points and take the examination for an amateur's certificate. The conditions necessary for obtaining such a certificate have been previously set forth.

Operators' examinations may be taken at the following United States Navy Yards: Boston, Mass.; New York; Philadelphia, Pa.; Norfolk, Va.; Charleston, S. C.; New Orleans, La.; Mare Island, Cal.; Puget Sound, Wash. Also at the following Naval radio stations: San Juan, Porto Rico; Colon, Republic of Panama; Honolulu, Hawaii Islands; Key West, Fla. The following United States army stations are also open for examinations: Fort Omaha, Neb.; Fort Wood, N. Y.; Fortress Monroe, Va.; Fort St. Michael, Alaska; Fort Valdez, Alaska.

Amateurs residing in Washington and vicinity may take their examinations at the Bureau of Navigation, Department of Commerce, Washington, D. C. Examinations are also held at the Radio Inspectors' offices or elsewhere by special arrangement.

Amateurs should write to the examining officer nearest to their stations and secure a copy of form 756—the application blank for an operator's license—and to the radio inspector for form 757 which is an application for a license for a land station. Amateurs at points remote from examining officers and radio inspectors may obtain second grade amateur licenses without personal examination. Examinations for first grade licenses will be given by the radio inspector when he is in the vicinity of their stations, but special trips cannot be made for this purpose. Persons holding amateur second grade operating licenses should make every effort to appear at one of the examination points to take the examination for an amateur first grade license or higher.

Land Station Licenses

To secure a land station license the applicant fills out a blank form on which he states the nature, type and character of his apparatus. The authorities use this information in making calculations and ascertaining the probable wavelength and range of the set. In their final decisions they are not wholly guided by the nature of the set alone, but by the local conditions surrounding the station and the probable interference that it will set up. The license having been granted the beginner may now communicate with his fellow amateurs to his heart's content, happy in the feeling that he has moved up a round on the ladder.

He now decides to inform himself on wireless more fully. He studies the intricacies of more complicated equipments; he attends lectures on the subject, becomes a member of a radio club, and incidentally lends a helping hand to the beginner at the bottom of the ladder where he himself once started. He becomes interested in the general progress of wireless telegraphy and purchases important works on the subject.

Books on Wireless for Amateurs

While there are a number of books published on wireless it is found that each publication is generally devoted to one particular phase of the subject. For general, all-around information the author recommends the "Year Book of Wireless Telegraphy," issued by the Marconi Publishing Corporation. Containing a wealth of data on the entire wireless situation, the information given in this book is indispensable to the amateur as a work of reference.

For a modern textbook covering the elements of electricity and magnetism as well as the more up-to-date equipments employed in radio telegraphic work, the "Text Book on Wireless Telegraphy," by Rupert Stanley, is recommended. While the description of some of the modern types of transmitting and receiving equipments are somewhat brief, the explanations given are sufficient to afford the learner an insight into the general construction and operation of the apparatus.

If the student desires to study wireless telegraphy from the standpoint of the United States naval practice, and incidentally desires a publication on the fundamentals of electricity, the "Naval Manual of Wireless Telegraphy for 1913," by Commander Robison, is of incalculable value. However, should he desire a complete account of the early experiments in wireless telegraphy, particularly those of Marconi, the "Elementary Manual of Radio Telegraphy and Radio Telephony," by J. A. Fleming, is the most comprehensive.

For general knowledge of the fundamentals of wireless telegraphy, but more particularly for the results of research work on receiving apparatus, the "Principles of Wireless Telegraphy," by George W. Pierce, is indispensable.

"Wireless Telegraphy and Telephony," by A. Kennelly, is recommended to the experimenters who require a simple explanation of the propagation of electromagnetic waves through ether. As the student progresses in his work he becomes desirous of owning a wave-meter but wishes a detailed treatise on its operation and general use. For him we recommend the "Wave-meters in Wireless Telegraphy," by Lieutenant Mauborgne.

There is no reason for the beginner who has been able to cover only from 15 to 40 miles to feel discouraged when he hears other amateurs declare that they have received signals at a distance of 2,000 miles. He should keep in mind that the latter results are obtainable only at night time during the more favorable months of the year. In the United States the time favorable for long distance working seems to be from about September 25th to April 15th, of the following year. The question as to what results can be obtained from the middle of April to the latter part of September is problematical.

When the amateur living in Minnesota informs us that he has heard signals from the Key West, Fla., naval station, and commercial stations on the Atlantic coast, he is undoubtedly voicing the truth; such accomplishments are possible, but only during the time previously mentioned. And, again, upon investigation, it will invariably be found that a sensitive receiving set thoroughly understood by the owner of the station did the work.

In attempts at long distance receiving many amateurs do not take into account the effects of local conditions. For example, if the receiving aerial is located behind a steel building, in the tree tops behind other structural steel work, or in valleys, signals from distant stations are not received as well as upon aerials which are in the open country, free from obstructions.

Receiving Detectors

Experimenters frequently ask the writer which of the crystalline detectors are the most suitable for the beginner. For the person who is absolutely uninformed on the adjustment of receiving

detectors, the cerusite or the perikon detectors are recommended. Cerusite possesses a peculiar property—practically the entire surfaec of the crystal is of equal sensibility. The perikon detector possesses somewhat similar characteristics, but not to the same degree.

Galena and silicon crystals are difficult to adjust and to maintain in the sensitive condition. Carborundum crystals are nearly as sensitive as cerusite crystals and will hold their adjustments indefinitely. In fact such crystals are extremely rugged and highly desirable where considerable transmitting is done.

The vacuum valve detectors are also very sensitive and quite stable in action, but require a little more skill than detectors of the crystalline type.

No mention has been made of the inductively coupled receiving tuner in this article as the subject was fully covered in two previous issues of The Wireless Age.

(*To be continued*)

Editor's Note: It is the custom of many amateurs to discontinue their experiments during the summer for various reasons. This, it is believed, is largely due to the general exodus of the experimenters from the city to the open country during the warmer months and the call of out-of-door sports. The experimenter who puts aside the opportunity to make experiments during the summer overlooks a large field of profitable endeavor and diversion. In the July issue of The Wireless Age will appear an article entitled "Amateur Wireless Telegraphy During the Summer Months" in the series on "How to Conduct a Radio Club." In it will be described a number of experiments and tests of interest, many of which were made directly under the author's observation.

NEW RADIO RULES FOR CANAL

The Hydrographic Office of the U. S. Navy announces to vessels approaching the Panama Canal zone: "As soon as communication can be established with the Canal, vessels should report their names, nationality, length, draft, tonnage, whether or not they desire to pass through the Canal, require coal, provisions, supplies, repairs, to go alongside of a wharf, the use of tugs, probable time of arrival, length of stay in port, or any other matters of importance or interest. If this information has been previously communicated through agents or otherwise to the captain of the port, it will not be necessary to report by radio, but the probable time of arrival should always be sent.

"No radio tolls, either coast station or forwarding, will be imposed against ships on radiograms transmitted by ships on Canal business. There will be no charge made against the Panama Canal by Canal Zone land lines or radio stations for the transmission of radiograms to ships on Canal business."

The naval service will claim no charges from ships on messages sent by masters of vessels to any government official in the Canal Zone, which messages contain information set forth in the first paragraph. Such messages will be treated as Canal business. In order to facilitate accounting it is requested that such messages be checked "CB," indicating that the messages are sent on Canal business.

CONSENT NECESSARY FOR BURIAL

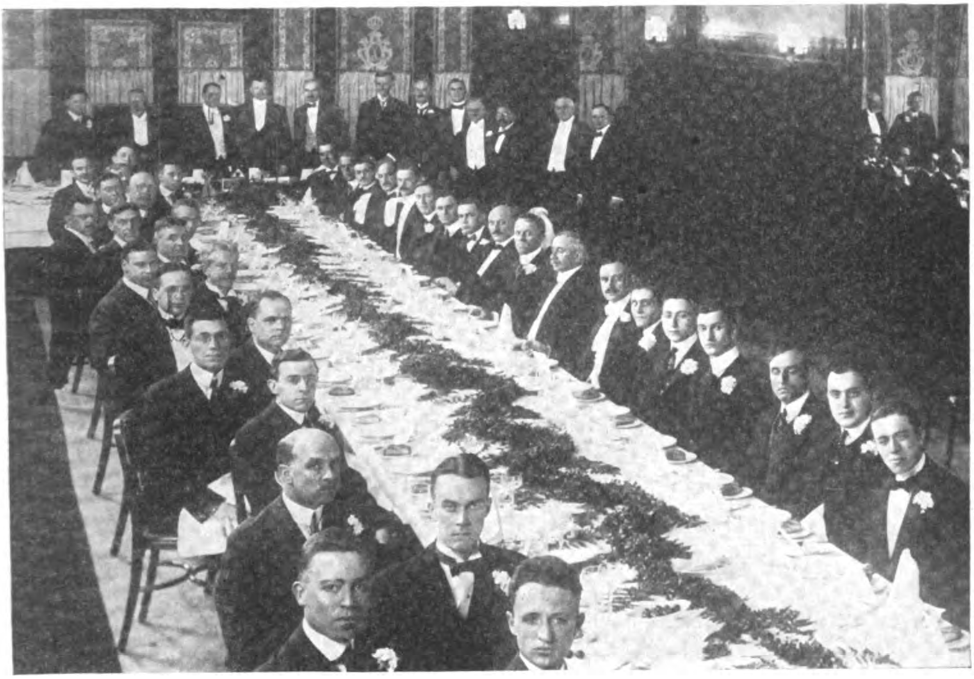
Judge Shearn in the Supreme Court. New York, recently overruled a demurrer of the Atlantic Transport Company, in the suit brought by H. Blair Finley, holding that a steamship company in this age of wireless has not the right to bury at sea, without the consent of relatives, a passenger who dies after the vessel has left port. Finley sued for $3,000 because his father, Clement B. Finley, was buried off Nantucket Shoals on a voyage of the steamship Minneapolis from London to New York.

The steamship company contended that the practice of immediate burial at sea is countenanced by custom. Judge Shearn ruled that in view of the facilities afforded by wireless telegraphy, whatever reason it might have had for existence is past. He gave the company ten days in which to answer preparatory to trial.

THE INSTITUTE MEETING

At a meeting of the Institute of Radio Engineers, held on May 5, at Columbia University, New York, Benjamin Liebowitz presented a paper on "The Pupin Theory of Asymmetrical Reports in Unidirectional Fields, With Special Reference to the Theory of the Goldschmidt Alternator." The theory of the Goldschmidt alternator in particular as developed by Professor Pupin was discussed.

Radio Institute Dinner



Photograph showing members of the Institute of Radio Engineers and others at banquet given in honor of Dr. Braun and Prof. Zenneck

WHAT was described as a "strictly neutral" feast was given by the Institute of Radio Engineers on April 24 at Lüchow's restaurant in New York. Dr. Ferdinand Braun, professor of physics, University of Strassburg, Germany, and a distinguished countryman, Prof. Johann Zenneck, were the guests of honor. In the gathering of eminent scientists many nationalities were represented, notably those of the belligerent countries, proving that the field of scientific research observes no outside influences. Warfare of another kind, the grim commercial battles fought out in the courts, was also represented in a delegation of notables from the National Electric Signaling Company, the Atlantic Communication Company and the Marconi Wireless Telegraph Company of America, all mingling on the friendliest terms throughout the evening. Judge Julius M. Mayer, who is presiding in one of the legal contests, was present, as he assured everybody, "in a strictly neutral capacity."

In the accompanying photograph may be seen those at the guest table; they are, standing in the background, from left to right: Prof. George W. Pierce, of Harvard University; Dr. Braun, John Stone Stone, president of the Institute and toastmaster; Prof. Zenneck, Dr. Lee De Forest, Nikola Tesla, Dr. Fritz Lowenstein, Dr. Alfred N. Goldsmith of the College of the City of New York, Judge Mayer, Dr. Karl G. Frank of the Atlantic Communication Company, Edward J. Nally, vice-president and general manager of the Marconi Wireless Telegraph Com-

pany of America, and R. H. Marriott, government radio inspector.

The speakers were Dr. Braun, Prof. Zenneck, Prof. Pierce, Dr. De Forest, Judge Mayer, Dr. Goldsmith, Nikola Tesla and Inspector Marriott.

Dr. Braun experienced some difficulty in expressing himself in English and begged permission to extend his thanks in his mother tongue. One of the surprises of the evening came when Dr. Goldsmith was later called upon and disclosed the fact that he had taken down in shorthand the guests' remarks, and forthwith read a translation from the German for the benefit of those who had not understood what had been said.

Prof. Zenneck spoke of the consideration he had received at all hands during his visit and Tesla followed with a summary of German scientific activities from the human interest viewpoint; he also expressed the hope that wireless would prove an agent of peace in binding the nations closer together. Prof. Pierce and Dr. De Forest spoke mainly of experiences of a humorous order in the early days of wireless communication, Judge Mayer defined the mental attitude of the judiciary and the difficulties in mastering the intricate problems presented in court. Mr. Marriott, in predicting accelerated development in wireless, took occasion to praise the amateur, the builder of experimental apparatus and the magazines which reported development and thus saved repetition of effort.

More than fifty members attended the dinner. Mr. Marconi arrived on the Lusitania but a few hours earlier in the day and although a marconigram invitation was delivered to him aboard the vessel before she entered port, a previous engagement prevented his acceptance and a message to this effect dispatched to the Institute was read to the assemblage.

WHISTLE AND WIRELESS COMBINED IN FOG

W. W. O'Farrell, electrician first class, first operator on the United States revenue cutter Manning, has reported an unusual experience.

"Along about the 4th or 5th of May, 1914," he said, "the Manning was lying at anchor in Alert Bay, B. C. About midnight a very dense fog shut down about the bay and the Inside Passage, well known to Alaskan travelers as very dangerous to navigation in foggy weather. I had the 12 to 4 a. m. watch, and about 3 a. m. had just finished clearing N. P. D. (Tatoosh), when a vessel very near Camosun called and asked where we were. I answered and told him we were at anchor in Alert Bay. He came back, saying that they were off Alert Bay, but had lost their bearings in the fog and were in a bad way unless they could find somewhere to anchor until the fog lifted. As I knew they were very near, I suggested that the operator ask his captain to blow the whistle, and that I would go on deck and listen for it. He did so, and on reaching the deck I could hear a whistle very faintly, which I guessed rightly was theirs. I then informed him that I could hear the whistle, and suggested he go and tell his captain that we would blow ours and he could then be guided to an anchorage near us. He did so, and the vessel was very soon anchored alongside of us.

"I do not know the name of the ship, as I did not look it up at the time, and promptly forgot all about the incident until the other day, when we again anchored at Alert Bay. I do not possess a foreign call book, so the letters will have to do unless someone is interested enough to look up the name of the vessel. I remember her call letters very well; they were V. F. Z.*

"I do not say that any lives or property were saved, but it certainly relieved the captain and passengers to know that they were safely anchored and not running in the fog without correct bearings, and also it may be a good thing for operators to remember in a like position."

It has been announced that the United States navy will establish a wireless station on Cape Cod especially equipped to guide vessels along the Atlantic coast in time of fog.

*The Camosun.

IN THE SERVICE

If early distinction counts for anything, good fortune should be with Chauncey D. Warner, assistant engineer of the Marconi Wireless Telegraph Company of America, for he started in life as a person of mark. This statemen is borne out by the official records of Webster County, Nebraska, which bear testimony to the effect that he was the first boy born in that county.

Warner's parents were among the pioneers who left New York State to establish a home in Nebraska, settling in Red Cloud, where the subject of this article was born. The recollections of his boyhood are of Indians, cowboys and bucking broncos, all of which made up an environment that might well have influenced the youth to follow any career but one requiring study and application. Young Warner, however, had in mind a course at the University of Nebraska at Lincoln, and accordingly he set out to realize his aims, with the result that he was enrolled as a student at the University. Outside of his studies his chief interests at Lincoln lay in the Engineering Society, of which he was elected president.

Warner was graduated from the University in 1896 with the degree of B. Sc., going soon afterward to Colorado, where he engaged in civil engineering. After spending almost two months in Colorado he returned to Red Cloud and began to consider plans for his future. In Nebraska and the neighboring states there was little opportunity to become identified with electrical industries, to which he had planned to devote his efforts, so he determined to make a place for himself in the field in the East.

His first employment was with the Iron Clad Rheostat Company, of Westfield, N. J. Then he entered the service of the Moore Light Company, with offices in New York, becoming assistant chief engineer and sales manager. During the development of the "vacuum breaks" and high frequency generators in 1902 he was in charge of the laboratory, afterward being detailed to the supervision of the sales and constructive work. About this time a small vacuum break-coherer set was designed and made up by means of which signals were transmitted and received from the tops of buildings in Newark, N. J., approximately one mile apart. Warner has taken an active interest in wireless since then.

He was in the employ of the Moore Company for fifteen years, entering the service of the Marconi Company in April, 1912. His duties with the latter company have included the supervision of the equipment of the Marconi stations at Ketchikan, Juneau and Astoria; the equipment of the United Fruit Company's stations at New Orleans, Swan Island and Santa Marta, and the direction of the equipment of various craft with auxiliary sets. He also aided in selecting the sites for the trans-oceanic stations at Belmar and New Brunswick. He recently acted as chief engineer while Frederick M. Sammis was on a tour of inspection of the stations in the Northern District.

Latest portrait of Marconi, taken aboard the Lusitania when he arrived in New York a few weeks ago

WAR CALLS MARCONI TO ITALY

The trial of the Marconi Wireless Telegraph Company against the Atlantic Communication Company for infringement of patents, which had been in progress for more than two weeks before Judge Van Vechten Veeder, in the United States District Court in Brooklyn, N. Y., would be adjourned, it was announced on May 21, after Guglielmo Marconi had declared that he intended to leave for Italy at once because that country was on the verge of war. Mr. Marconi arrived in New York on April 24, being one of the principal witnesses in the case.

In a brief address to Judge Veeder he said that after consulting the Italian authorities in New York he had been advised to return to Italy immediately. Although war between Italy and her foes had not yet been declared, he explained, it seemed to be a matter of only a few hours. Mr. Marconi then shook hands with Judge Veeder, the counsel for the Atlantic Communication Company, and Johann Zenneck, a German expert, who had been summoned from Belgium to testify.

Judge Veeder said that the trial would be adjourned for several months and that a further adjournment would be taken in the event that Mr. Marconi could not return at that time.

In the course of the trial two wireless equipments were set up in the court room by the defendant company which attempted to show the difference between its apparatus and that of the Marconi Company. One session of the court was held at the wireless station maintained by the defendant at Sayville, L. I., Judge Veeder wishing to make a close inspection of the parts of the apparatus in dispute. While at Sayville Mr. Marconi sent a test message to Arlington.

Mr. Marconi, who is an officer in the Italian navy, believes that it will give an excellent account of itself. He said that its officers and men are well trained and that a number of new ships had been commissioned since the European war began, among them being several of the dreadnought type. The economical situation in Italy, he declared, was good.

He believes that if Germany and Austria-Hungary had consulted Italy during the crisis that preceded the outbreak of the war, the conflict might have been prevented. The Italian government did not favor the war.

Mr. Marconi left New York on the steamship St. Paul on May 22, for England. From that country he will proceed to Italy.

MARCONI ORDER AFFIRMED

Judges Lacombe, Ward and Rogers, sitting in the Circuit Court of Appeals, New York, handed down a decision on May 13, affirming the order of Judge Hough granting a preliminary injunction restraining the De Forest Radio Telegraph & Telephone Company, the Standard Oil Company of New York and Lee De Forest from infringing the fundamental Marconi and Lodge patents relating to wireless telegraphy. It had been urged before Judge Hough and the Court of Appeals that it was inequitable to grant the injunction because the Marconi Company had recently raised its rental price to steamship companies to $100 a month. Judge Hough said in his opinion:

"The action of Judge Veeder and that of the courts of the Third Circuit in respect to the Fessenden patents, followed by a treaty of peace between complainant and Fessenden party, has undoubtedly put the Marconi Company in a much stronger position than it previously occupied. I am convinced that down to the present time the expense of operation (and of litigation), has been so enormous that complainant has received no fair return from the invention which under decisions now ruling I must hold to be of the greatest value and worthy both of praise and reward."

The decision of the Circuit Court of Appeals in effect affirms this ruling of Judge Hough. The decision also affirms the orders of Judge Hough denying the motions to vacate or modify the injunction as well as motions to suspend the operation. The court stated that it was not necessary to add anything to the discussion, as the Marconi and Lodge patents and the prior art had been fully and carefully considered by Judge Veeder in the suit of the Marconi Company against the National Electric Signaling Company.

The Radio Development Association of Hamsville

Prologue

Several years ago amateur wireless telegraphy was only beginning to take firm root and few experimenters were possessed of the finely finished instruments to be seen in numberless stations of the present day. There were no radio inspectors to hamper the amateur's wave-lengths and prescribe doses of rotary gaps and oscillation transformers for the treatment of impure or broad waves, so these were of every length from one hundred to several thousand meters.

In a general way, however, there were many wireless stations—and there was a particular one at Hamsville, a sleepy village of less than three hundred inhabitants, lying in a sheep ranching district far up in the foothills of Northern California. (Of course the real name of the village is something else, but even under its true name, Hamsville probably could not be found on any self-respecting map.) Hamsville would have been a pitifully unimportant and antiquated hamlet but for one thing. Its citizens—that is, a few of them—had electric light service, a phenomenon due to a power company having constructed a hydro-electric plant on the Rocky River up in the Snow Mountains and running a high tension line from there to a distant city. As this line passed only a few miles to the westward of Hamsville, the enterprising power company ran a small branch line up to the village; but it had not proved a very profitable investment, for about a dozen families, all told, could be induced to use the current, and then only on Sunday nights when callers came. In such a peaceful environment one would hardly have expected to find so modern an accessory as the amateur and his wireless apparatus. But there they were, and if it had not been for the heavy current consumption consequent thereon the branch power line would probably have fizzled out entirely.

Neither would the incidents related herein have occurred, which of course is of more interest to you and to me.

CHAPTER I

IT is of little importance, chronologically or otherwise, but for the sake of accuracy it may be well to state that the story opens on a chilly December evening. The young wireless men of Hamsville were congregated about the dilapidated stove in 'Lectricity Bob's station. There was Fred Schindler, and there was Slim Slattery, while behind the stove sat Johnny Sprague, a quiet little fellow of eleven; and next to him was Spunk Gilmore, an ignorant dare-anything who played hookey from school about five times a week on the average, and whose pursuit of radio knowledge was seriously hampered by ignorance of correct spelling. The group was completed by Robert Morrison, who had put up the first aerial in Hamsville and was generally known as 'Lectricity Bob. He had been an electrical experimenter ever since the day that storekeeper Henry Brown had given him an old-fashioned electric door bell outfit, principally because it had laid on a shelf in the store so long that Henry finally became convinced that he would never get rid of it unless he gave it away. From that humble beginning Bob had progressed

rapidly and, as we now see him, had become the owner of a complete wireless station.

This was located in an old shed which had served for many years as a chicken coop; the fowls finally being ejected to make room for 'Lectricity's wireless set when it had grown beyond the size his mother would permit on a table in the front sitting room. The chicken coop, renovated and given a coat of whitewash, had since been spoken of in awesome tones as "'Lectricity Bob's wireless plant." The station's principal claims to largeness, however, were those of comparison. There were four other "plants" in the town.

Bob was the possessor of a big transformer which he had constructed mainly from the charred remains of a burnt-out pole transformer given to him by the light company. He had rewound it in a haphazard fashion and it pulled so much current that every light within a quarter of a mile dimmed or went out entirely whenever he pressed the key. This transformer produced a tremendous spark in the gap, which Bob kept as wide as he dared, decreasing the efficiency of the set perhaps, but greatly improving its noise-producing qualities. Holding the key down for several minutes at a time and watching the sparks flash was a pastime that sent the wheel in the meter racing like a fan motor, but was a source of much pleasure nevertheless. This gratifying pursuit could not be enjoyed *ad lib,* however, since the transformer became hot as a stove after being used steadily for a few minutes.

Another treasure the electric light company had contributed was a large ammeter; this he had screwed to the wall, although it had not been connected up, for as Bob had told his friends: "It's a perfectly good ammeter, only part of the inside has been took out of it; and it don't make no difference anyway, 'cause even if it won't work, it is just as good as if it did." His friends had agreed that this was true.

Then there was, of course, a condenser for his transformer; a condenser which consisted of a great number of tin foil covered bottles of all sizes and colors, with the tops broken off to make possible the inside coating. The bottles were in a soap box under the table and when the set was in operation the container filled with blue fire. A helix hung from the roof just above the table; it was an immense square arrangement which Bob had made by winding a piece of galvanized iron fence wire around a heavy frame constructed from the abandoned chicken roost. This apparatus, together with a couple of needle point gaps to take care of the kickback, a couple of switches and a home-made key, completed the transmitting equipment.

Despite the generous size of all the parts of this set, Robert never worked with anyone outside of Hamsville. This might have been because there was a difference of about three hundred meters between the open and closed circuit wave-lengths, or possibly because there was no other amateur within several hundred miles of Hamsville. But such communication details made no difference to the aspiring amateur; as long as he was able to exchange signals with his four friends in the village and had a good fixed spark he was entirely satisfied.

Although Bob was seventeen years of age and still poking along in the sixth grade in the little public school at Hamsville he was looked upon by the people of the village as an extra smart boy. To them, he was a born genius—one destined to make a name for himself in the world. They would have called him a second Edison, had anyone among them thought of it. All Hamsville could, and did, tell each other and all strangers how Bob had not only constructed his wireless plant single handed, but had also personally supervised the transformation of soap boxes, tin cans, bell wire and such heterogeneous collections of junk into instruments for the village's four other young emulators of Marconi.

These four boys held Bob in highest esteem; he had taught them all that they knew about wireless, and was always ready to come over and help them out when their sets refused to work. The services of the consultant usually were required because they had forgotten to close the aerial switch (if they had one) or because their seventy-five ohm telephone cords were disconnected. But in

either case, 'Lectricity Bob was all-sufficient. In fact he was omnipotent.

Who but he could have initiated them into the exciting operations of tuning for the two outside stations they could hear, Mare Island and San Francisco? He alone had guided them through the intricacies of tuning coil construction, and shown them that a variable condenser was nothing more than Van Damp's bean can, covered with paper and arranged to slide into a tomato can fastened to a board. He, too, had laid bare to them the paper and tin foil secrets of the fixed condenser. Of the code he was a master. In the approved copying attitude he would listen to the press which came buzzing in at the great speed of about sixteen words a minute, and he could get a couple of lines once in a while; as a matter of fact on several occasions, at the expense of strenuous mental effort, he had copied a whole news item partly correct.

Once he had heard Mare Island sending a long official message to a battleship, and he copied it without losing a single letter. That the battleship was about two thousand miles out in the ocean and the static so very bad that the message was sent at about ten words a minute and repeated three times, was not mentioned; but even had it been known, the triumph would still have been as great. Every one in Hamsville heard about it and thought it a most remarkable feat—another proof of Bob's superior ability. The young man in question was as pleased with himself as a successful graduate from the Marconi school who has just got his license, and he tacked the message up in a conspicuous place on the wall near the ammeter, so that whoever might chance to visit the station would not fail to see it.

But to return to the chilly evening when the five Hamsville amateurs were warming the stove in Bob's station:

Bob was just telling them of an idea which had popped into his head that very day. He had been reading how many of the amateurs in the big cities were forming wireless clubs, and had conceived the idea that he and his friends might well do likewise. "We can have a club as well as them other fellers," he insisted.

"Aw, what's the use of us doin' that?" asked Spunk. "What do they do in them clubs you've been tellin' about?"

"Oh, they have a president and they have some place where they have regular meetings, and so on," explained Bob. "Can't you see what a lot of fun it would be for us to do it?"

"Yes, I see—like a blind man," said Spunk. "Can't we meet here just the same as we've always done, whether we have any club or not?"

"Well I reckon it would be pretty good all right," ventured Slim, "only there ain't enough of us to have much of a club. Time we 'lect some other officers 'sides a president there would be nobody left."

"Well, that don't hurt none," Bob assured him.

"There won't be no scrap then about who's goin' to be the officers and who's not, will there?"

"We can do it all right," interrupted Fred. "I reckon we can do it just as well as them city fellers what Bob's been tellin' us about."

"What are you goin' to call this-here club anyway?" inquired the still dubious Spunk.

"Well, I haven't thought of a good name yet," replied Bob. "But we don't want no common name like Hamsville Wireless Club, like all these other fellers are doin'. We want to have some classy, important sounding name, like the World Wireless Company, or sumpin' like that."

Whereupon all question as to whether or not they should have a club was forgotten in the animated discussion about its official title.

"Dad" Morrison, who had retired an hour before, was awakened by the discussion in the wireless station, almost directly underneath his bedroom window. After trying vainly to go to sleep again, he very unwillingly got up and went downstairs. "What in tarnation's the matter in here, anyway?" he demanded, poking his head in the station door as he shivered uncomfortably in the cool night air. The argument subsided. Bob commenced to explain that on this hallowed ground was being formed a wireless company, and the consideration before the house was the selection of a name "whereby best to call it."

"Gol dern ye," interjected the exas-

perated father before Bob could finish, "do you think me and ma are agoin' to be kep' awake all night on account of that humbug bizness? Gol darn it." He paused for breath. "Ye'r up to some fool monkeyshines all the time. Every night either some of you fellers is a-roostin' here jabbering away like sixteen bluejays an' a talkin' machine or else that dern contraption," and he pointed expressively at Bob's spark gap, "is a-bangin' away like a Fourth of July celebration. You'd ought to call yourselves the Bughouse Wireless Nuts Company for the Prevention of Sleep; that's what you ought, by heck," and with that brilliant suggestion he slammed the door shut and went grumbling back to bed.

The discussion came to an end shortly afterward, not, however, until Bob had selected from a wireless magazine a name which they all agreed would be satisfactory. The name, The Radio Development Association of Blank City, amended to Hamsville, so as to properly fit their own organization, was unanimously carried in a rising vote.

"Golly! that's a swell sounding name, ain't it though?" exclaimed Fred enthusiastically. "I'll bet none of them can beat that!"

"Yep, it sounds all right I reckon, but it's plagued hard to remember, and we don't any of us know eggsactly what it means," objected the fault-finding Spunk.

"That don't matter none," Fred assured him. "We can all write it down on a piece of paper so's we won't forget it." Whereupon each proceeded to do that very thing.

The meeting then adjourned, after they had agreed to sit in executive session on the following night to appoint the various officials needed for the association.

A full hour before the time set the members of the R. D. A., as they already called it for short, were assembled at Bob's station. That is, all except Spunk, who put in a belated appearance which he explained was due to having been obliged to do some repair work to his set that evening; he had kept at it until he had finished.

"By the way, what was the matter with your outfit last night, Spunk?" inquired Fred. "I was callin' you a long time and you didn't come back."

"I heard you all right," replied Spunk, "but I couldn't work my coil," and his face filled with indignation. "Yesterday ma she got a leak in her teakettle, which same teakettle she didn't want to throw away, seein' as how she had only had it for about a year, so pa he tried to solder it up fer her an' he didn't have no soldering acid, an' so he went an' took the dope outa my 'lectroliquidic interrupter, an' he used up so much that I had to fix up some more today—an' he never got the teakettle fixed neither! Doggone it anyway, pa's always takin' my stuff when he wants it fer somethin'; the other day he wanted to take my aerial wires down to make a clothesline with fer ma, an' I had a hard time to keep him from doin' it, too." Spunk's voice broke with indignation.

"Shucks, that's nothin'!" replied Fred, "you didn't get licked like I did. I was trying to make one of them acetylene gas lights for my magic lantern, like what I read about in the Farmers' Magazine, and last Wednesday night I had it in the house trying to make it work. I kept putting matches to it, but it wouldn't burn worth a cent. The Farmers' Magazine said to add more water if it didn't burn good, so I did; an' when I tried to light it again the dang thing took fire all over an' exploded or somethin' an' one of the pieces flew up and hit the hangin' lamp with a bang an' made a big dent in the shade, an' the water run all over ma's floor an' ma she got mad an' grabbed me

an' helped pa to give me the worst lickin' I've had in two weeks." The experimenter stopped for breath.

His hearers sat in silence; evidently something more was expected of him. "An' it cost mor'n fifty cents to make it too," he added mournfully.

But with such incidents, or accidents, as matters of common occurrence the troubles of the five were soon forgotten in the excitement attendant upon the important task of appointing officers of the R. D. A. Bob was made president as a matter of course; Fred was appointed secretary, and Slim secured the office of treasurer. Then the five faced an unexpected problem. Spunk and Johnny were still to be elected and no one could think of any other offices to be held. The question was considered long in silence. Puzzled glances passed back and forth among the group. Suddenly Slim exclaimed:

"Say, don't they have assistant president or sumpin' like that in those reg'lar companies?"

"Oh, sure! I forgot all about that," replied the newly elected chairman with relief. "They have vice-presidents; at least I think that's what they call 'em."

A magazine was sought and the title verified. So Johnny was made vice-president, and, following up this new idea, Spunk "vice-secretary," an office which Bob finally convinced him would not call for particularly strenuous efforts in discharge of duties."

"Now, there's one more thing that we've got to do," said Bob, "an' that's to fix up a constitution."

"Whadda'ya mean, Kahn's tertushun?" demanded Spunk. "How much will it cost? Can we make one?" he demanded further. "Doggone it! what's the use of all this hard work a-makin' officers if you have to do more all the time? Do all companies have officers and this feller Kahn's tertushuns?"

"Constitution is the word," corrected Bob patiently. "It's not a 'lectrical device. It's a paper. Remember one time we read in the history in school how the United States has a constitution that was wrote by George Washington an' some of his friends, an'——"

"Naw, not Washington, Aberham Lincoln," interrupted Fred in a positive tone of voice. "I know 'cause I studied thaf hist'ry a lot."

"Aw, shut up," growled Spunk. "It don't make no difference who wrote it; a Chinaman might have done it f'r all you know."

"Well, I wasn't sure which one did it," continued Bob. "Anyway I was goin' to say that this constitution is a lot of laws tellin' what's to be done with murderers, fellers who go duck hunting outa season and all such."

"What's that go to do with us?" came from the unenlightened one.

Bob looked at him disgustedly. "Ain't I been tellin' you all the time that we got to have laws for our company same as the United States has, an' all companies has?"

The general idea finally percolated into Spunk's consciousness and the group forthwith set about drawing up a set of rules to govern the activities of the R. D. A.

Regulations beyond counting were suggested and passed in the hour following, but the keynote was contained in three rules which can be mentioned here:

Rule 9 provided that "any person joining the R. D. A. must have a wireless outfit and must know the code."

Under rule 10, "No person was allowed to send more than seven words a minute," to which was added: "Except when sending to the president, when eight and one-half words is allowed."

Rule 15 insisted that "no girls or any other females will be allowed in this company."

The rules were committed to memory and the secretary instructed to later transcribe them to paper. "I'll bet you old Lincoln himself couldn't have done it any better'n that," said Bob when the work had been completed to the satisfaction of all present.

Spunk rose and stretched luxuriously. "I'm goin' home," he said.

Thus adjourned the first meeting of the organization which purposed to be a means of great uplift in the community.

CHAPTER II

Ten months had passed by. The chicken coop still boasted a big sign

above the door, painted in rough black letters and telling to all that here were the "Headquarters of the R. D. A.," while on the door itself was a smaller sign carrying the afterthought, "Main Office."

It had been a period of great development and some expansion. The R. D. A. had picked up one new member, but his interest in wireless proved to be but a passing fancy and he had been dropped from membership.

What had started on its career in a whirl of enthusiasm now seemed to be quietly passing out of existence. The R. D. A. had not held an official meeting for some time.

Bob refused to see an end to his hopes. Many times he had thought of engaging prospects and attempted to gather the clan about him, but he had failed. On the night which caused this chapter to be written, however, he had a brilliant inspiration. Steadily, for upwards of a half hour, his crashing spark shook the little building. The four brother members finally heard the general call and noted down the request that they assemble without fail in the headquarters on the following Saturday night. Further inquiry was summarily cut off; not a word would the president tell of his plans. When once the summons had been acknowledged his crashing spark ceased.

It was a master stroke of advertising. Four heads immediately bobbed closely together and the buzz of speculation continued through the two nights intervening; on Saturday they were assembled long before the time set.

Bob rose to address them with a dignity that hinted at things mysterious and inviting. "You know," he commenced, "we haven't done anything with our club for quite some time, an' I've been figgerin' with all my might to get up some new things for us to do. I've been studyin' about it for quite a spell, but I couldn't think of nothin' . . . until just the other night, when I told all you fellers to come over. All of a sudden I thought of a fine stunt we could try—have a lot of fun and make a lot of money."

"Well, hurry up an' tell us. What's the plan? Give it to us," came from the impatient Spunk.

"Shet up!"

"Hold yer way."

"Hold yer horses!"

"Wait a minnit, can't yer?"

"Order!"

"I think we could have a great time," continued Bob, swelling with visible importance, "if we should take a wireless set and go round to some of the towns in the valley, an' hire a hall an' give a wireless show. We could put up a set an' hang up some wire on the roof or somewhere's an' hook a bunch of receivers onto the set an' let the crowd listen to Mare Island, whenever he gets goin', an 'then I could bring my sendin' outfit an' show 'em the spark an' I think it would be a great scheme, don't you?"

All four listeners were so dazed by the dazzling possibilities and the wonderful flow of language that for a few minutes they would say nothing on the scheme so suddenly placed before them. Even the doubting and fault-finding Spunk was at a loss for words to fittingly express his emotions. The project was amazing; napoleonic.

"I think," continued Bob, visibly swelled with pride, "that we had best try Bingleton first, 'cause it's the biggest town in the valley an' besides the Ladies' Improvement Club in Bingleton have got a extra big hall, an' there they have a dance every month an' so you see we could go over there some time when they're a-goin' to have a dance an' put up the wireless set in one of them side rooms they've got there.

"We could let in 'bout twenty-five at a time an' let 'em hear the signals an' show 'en the spark an' then send 'em out an' take in a new bunch an' so on." The president's voice had been rising in cadences that broke into a shrill treble as with an all-embracing gesture he effectively delivered his climax: "We could charge about two bits apiece—making as much as thirty dollars all in one night!"

"Whew!" gasped the circle.

"Golly! that would be a lot of money, wouldn't it though?" said Slim in a voice filled with awe.

Spunk looked puzzled and the frown deepened on his brow; it was difficult to find something wrong here. Then: "But how are we ever goin' to pack a wireless

outfit an' ourselves an' such things as we'd have to have, clear down to Bingleton?" he announced in a voice of triumph. "It's twenty miles away from here."

But Bob, like a true, shrewd general, had prepared for all contingencies. "I can fix that all right," he replied with studied carelessness. "We can take them there two colts what pa had broke in last winter an' hitch 'em to the spring wagon an' I just reckon we'll get there all right, all right."

"Get there in pieces," forecasted Spunk gloomily, for he had painful memories of the time when he had rashly attempted to ride one of those colts.

"I think it would be better if we got a whole hall some time when there ain't no dance," offered Fred.

"I thought of that," said Bob, depreatingly, "but the suggestion's no good. It would cost a lot of money to get the whole place, an' besides there is always a big crowd to the dances an' so we'd be sure of gettin' a few people anyway."

"'Lectricity is right about that," agreed Spunk for once.

Various projects were then discussed, ranging from the money-making possibilities to inserting a piece in the Bingleton Courier, "about the great wireless show run by the R. D. A., of Hamsville." In the midst of the discussion the president rose and rapped with a piece of kindling for order.

"I've got here a letter what I've already wrote to the old hens' convention," he announced. "I'll read it to you." The letter ran as follows:

"Dear Ladies, we wud like to bring a wireless set and come over to Bingleton some time when you are going to have a dance and give a wireless telegraphy show. We wud like to know if we cud git one of your small side rooms in the hall some night when there is goin' to be a dance and we will bring there our wireless set an set it up durin' the dance and how much wud you charge for it and when are you goin to have the next dance.

"yours truly,

"ROBERT MORRISON,

"President of the Radio Development Association of Hamsville.

"p. s.—Address is Robert Morrison Hamsville."

"Gosh! That sure is a swell letter, all right," said Fred, enthusiastically. "It sounds just as good as them letters them Senators down in Washington has been writin'. I'll bet you them there women will think we're sure some big outfit."

"An' I had some job to write it, too, let me tell you," declared Bob. "It ain't no simple thing to spell out the full name of the R. D. A. It was the first time I had to spell it for 'bout three months an' I had to go out an' look at the sign on the wall an' so's to be sure that I get it right I bet I had to look at it 'leven times at least."

"I s'pose that new howlin' spark bizness of yours will figger prominent in this, 'Lectricity?'" ventured Spunk.

Bob nodded assent. The device referred to was his particular pride and joy, the particular pride and joy of all for that matter. What Spunk had referred to as a "howlin' spark bizness" was in reality a rotary gap, the most recent addition to Bob's set. Envious for a long time of the descriptions he had read in the wireless magazines, the electrical genius of the circle had worried exceedingly over the lack of the more advanced type of spark. The spark of a set, to him, was the main thing; but he had been unable to build one, through lack of a motor. One day, however, he had accompanied his father on a trip to a neighboring village and when they returned Bob was in possession of an old discarded fan motor, rescued from a pile of miscellaneous junk in a wayside blacksmith's shop. After hours of patient toil he finally succeeded in getting it to run with uncertain regularity. Then it was fitted with a wooden disc carrying a number of large wooden screws driven about its circumference and equipped with the two usual standards on each side of the disc. In its working the gap exceeded even the most sanguine expectations of its creator. It would start up with a sort of low, moaning sound until it had reached full speed, when its weird crescendo rose to a wailing screech like that of a lost soul. It could be heard a great way off, and on the first night it was put in operation it created what amounted almost to a panic of terror in the immediate neighborhood. No one could have foretold what the consequences would have been had the gap

worked with regularity, for Bob was in the habit of sitting with the key depressed, listening enraptured to the screeching. For about three minutes this would continue, and then the motor usually went out of business. All would be quiet for a period, excepting for a faint tinkering with the motor. It would begin once more, only to be mercifully silenced a few minutes later.

"In addition to the rotary gap," said Bob, "we can take along my whole sendin' outfit an' we'll gather up a good bunch of tuning coils, fixed condensers an' things to fill out with so's to make it look like a big set." Everybody thought this was a good idea and the meeting adjourned when Bob remarked, "I'll mail this letter to-morrow."

The anxiously awaited reply came a few days later and requested that the R. D. A. send a representative to Bingleton to consult with the ladies' committee. This was responded to with alacrity and in the person of the president, who reported that evening a terrible session filled with embarrassing moments. Permission had been granted them, nevertheless, although it was specially provided that the boys should pay for any damage which might result from the introduction of this innovation. "A great big woman, lookin' like one o' the warriors in the history book, had an awful lot to say and come pretty near not lettin' the R. D. A. give the show because we wuz all boys. I give her so much 'lectrical talk, though, that she figgered I knew everything that wuz ever writ an' that's how she come to give in," boasted Bob in telling of the interview. "I told her we did not require much current, too, an' I've been wonderin' whether them lights over there are goin' to blink like these here in Hamsville does when I use my set. . . . Gee, I hope it'll be all right."

"Sure, it will," said the others hopefully.

And thus it was that on a Saturday morning two weeks later, a cheerful crew set forth in a spring wagon filled with instruments and headed towards Bingleton down in the valley. At nine the two young colts were pulled to a stop 'mid a chorus of "Whoas!" and the five future Marconis gazed appraisingly at the hall which was their destination. A room which had been recently converted into a public library had been placed at their disposal, and here they promptly assembled. While two wires were being strung from a nearby flagpole to the roof of the hall, the heterogeneous mass of apparatus was being laid out on the table and connected to a lead which was brought in through the window.

The equipment as installed consisted of Bob's sending outfit, complete with the formidable rotary gap, while for receiving there were a number of detectors, tuning coils and odds and ends of this and that, selected from the stations of the other four. Most of this apparatus was not connected up in any way with the working units, but lay in an impressive array on the generously proportioned reading table. "Just to fill in an' make it look bigger," as Bob expressed it. Two single high resistance receivers and one low resistance watch case receiver lay, side by side with another which plainly showed signs of long service on some wire telephone. Current was brought to the transformer through a cord run to a chandelier and it was tested out with great excitement and rousing cheers from a number of small boys who had gathered about the hall and were watching the proceedings with the greatest curiosity, not unmingled with awesome admiration.

With but a single stop for a snack of luncheon at noontime, the work was pushed forward steadily and early in the afternoon all was thought to be in readiness. Then Fred suddenly startled the assemblage by the whispered intimation that no signals could be heard in the low resistance receivers, although they could be heard quite plainly in the others. Alas, it was true; and despite Bob's most heroic efforts the refractory something refused to disclose itself. After hours of unsuccessful testing and experimenting the others were ready to give up.

The president noticed the flagging spirits of his erstwhile staunch supporters and redoubled his efforts. It was no use. Seeing that the widely advertised wireless show was liable to go by the board, he rallied them around him with a stirring peroration which emphasized

the thirty dollars and the necessity and desirability of acquiring same—by artificial signals. The drooping spirits revived and the plan was quickly unfolded.

A cigar box was secured and the buzzer which Bob had used for adjusting his detector—the same one which had been furnished gratis by Storekeeper Brown—was placed in the box and packed around with pieces of newspaper. The clapper had been cut off and the buzzer padded with a small piece of rag to make it give a high-pitched note. When connected up it could be scarcely heard in operation in the cigar box, but it could be heard in all of the receivers to which it was connected. Two wires were run out to the wagon; this was placed close to a small back door in the library and it was arranged that Spunk should be stationed on the driving seat and would manufacture signals by touching the two wires together. "We can tell 'em it's Honolulu talking to San Francisco," said Bob. "An' they'll like it just as well as if they heard the real ones, 'cause they won't know the diff'rence anyway." But the explanation was unnecessary; the others had been readily convinced that this was the best thing to do.

Late in the afternoon the colts were hitched up so that an early start could be made on their long homeward drive when the dance had been concluded; as later events proved, this was most fortunate preparation. The plan of action for the coming evening was then rehearsed and it was decided that Johnny, who was the quickest at figures, would sell tickets, and Slim would take them at the door, while Bob and Fred would operate the set and Spunk furnish the signals from the wagon.

CHAPTER III

It is strange what momentous issues sometimes grow out of the most trifling causes. Thus the tiny flame of a match may cause a burned city, and rich men's sons like Clyde Marlow may happen by the merest chance to notice the heading of an announcement in the Bingleton Courier and set the fates at variance with well laid plans.

Clyde was on the return trip from a long drive to the Rocky River in a new automobile and was accompanied by his friend, Randolph Morgan. They had stopped at a road house for refreshments and Clyde was idly glancing over the four pages of the weekly sheet when he came upon the heading,

R. D. A. TO GIVE BIG WIRELESS SHOW

His curiosity was aroused, for he himself was a wireless enthusiast and the owner of a very complete and expensive, not to mention efficient, station in Santa Rosa. And so he continued to read.

> The Radio Development Association of Hamville, composed of five young men of that town, have arranged to give an exhibition of the wonders of wireless telegraphy at the Ladies' Hall on Saturday night. The members of the organization are the owners of very powerful and complete wireless stations, one of which they will instal in the library and operated under the direction of Robert Morrison, son of our esteemed neighbor, Silas Morrison. Young Morrison is president of the educational association, which in this distinctive manner makes its initial bow to Bingleton. A series of remarkable experiments, illustrating the wonders of long distance receiving, will follow a comprehensive lecture on the principles of this wonderful art.

"Piffle!" ejaculated Clyde. "A powerful wireless station on a reading table," he observed in a tone of disgust.

"What's that you're saying?" came from Randolph, who was also the owner of an up-to-date station.

"Read this," and Clyde, dispensing with further explanation, handed over the paper to his friend after indicating the offending news item.

When Randolph had read it he looked at his companion with an amused smile. "Seems that this bunch of hammy hayseeds of Hamsville are putting something over on the highly esteemed citizens of Bingleton, eh, what?" he observed.

"It certainly looks as if they were going to try to," the other answered. "But what beats me is, how on earth wireless telegraphy ever got started way up here among these sheep ranches. Bingleton is a little burg in the valley about fifty miles from here,

a little bit of a place; and Hamsville—well, I've never even heard of it before. Some crossroad up in the foot-hills, I suppose."

Clyde turned again to the item. "Say, this fracas is to come off to-night! Just for a lark, let's run over there and see what they've got. It's about five o'clock now and if we start at once we can reach Bingleton by eight at the latest. I guess this new gasoline chariot of mine will take us over those hills in jig time." But the rutty roads they soon encountered considerably slowed down the predicted pace.

. . . .

Meanwhile things were happening at the hall. At about seven o'clock the five members of the R. D. A. began to do business; a number of ranch hands and other young men of Bingleton came early so as to take in the wireless show before the dance started. Quite a crowd grouped themselves about the table. Bob soon found that he would have no need of the lecture which he had laboriously written and memorized several days before, as the spectators immediately plied them with questions, not over half of which they could answer. Out in the wagon seat Spunk was faithfully touching the two bare wires together and creating a meaningless jumble of dots and dashes in the receiver which the members of the audience listened to in turn with many expressions of awe and wonder.

"An' you say that a feller way over in Honolulu is makin' that there noise?"

"Ain't it the beatenest thing?"

"Jest think of hearin' them stations what's four or five days' journey away!"

"An' there ain't no wire connection, either."

"'Course there ain't; how could these here little boys get 'nuff wire to reach from here to Honolulu?"

The comments grew in volume and amazement grew apace as each new wonder was unfolded. "So that there feller over'n Honolulu, he's a-talkin' to another feller in San Francisco!" repeated old Jake Prout, by admission the champion well digger of California. He shook his head uncomprehendingly.

That gentleman struggled mightily to free himself

"Kin the station in San Francisco hear him now, kin he?"

"Why sure he can hear him," replied Bob, astonished. "Why not?"

"Well," replied Jake, "I can't figger how the feller in San Francisco can hear him when all his noise is comin' in this here machine."

This was the opportunity Bob had awaited. In the gravest tones he could command he delivered the time-worn explanation of the wireless set sending out waves in every direction, in the manner of ripples set up when a stone was thrown into a quiet pool of water.

"An' them there wires hangin' outside on the flagpole catch them waves?" exclaimed a bystander.

"Sure they do," replied Bob. His voice had taken on a note of superiority.

"Don't think much of that arrangement," snorted the questioner. "Seems to me I'd get a clothes basket."

"A clothes basket? What good would that do?" said Bob.

"A big, roomy clothes basket I cal-c'late would ketch more waves than them two smooth fence wires hangin'——"

"Say, what's that thing fer?" interrupted another, pointing to the fixed spark terminals inside the helix.

"That's a spark gap," explained Bob

in a wearied tone of voice, "an' when the set is workin' a big spark jumps between those two rods."

"An' 'cause that spark is so powerful and so dangerous you have to keep it in that cage," ventured Ezra, a chicken rancher.

"Sure," said Jake.

"Do tell, now, ain't it jest wonderful?" observed someone in the gathering.

When all present had enjoyed to the full the alleged signals from Honolulu, Bob stepped to the other end of the table and impressively closed the little battery switch. He had thoroughly tested out his transmitting set in the afternoon and as there had been no lights burning in the hall the line had been able to withstand the heavy pull of the transformer. Now practically every globe in the hall was turned on but Bob had not given that a thought. The rotary gap started up slowly with a rattle and a clank, amid many exclamations of wonder from the spectators.


Ezra catapulted through the open window

"Now," said Bob, when it had attained full speed, "you watch that wheel and I'll show you the spark that does the sendin'," and as he spoke he pressed the key. The blinding spark screamed out for a second, but the load was too much—"Vut!" went one of the big fuses in the power side of the meter. Every light in the building went out. It was as dark as a coal mine in the library.

"Help! Murder!" arose in a high shrieking treble as the belle of Bingleton threw her arms around Ezra's neck and hung on for dear life, while that gentleman struggled mightily to free himself, wondering meanwhile whether he had been struck blind or entirely killed.

Jake Hood, who was standing near the gap, lowered his head like a mad bull in a charge and made a frantic dash through the darkness toward the place where he estimated the door to be. But his sense of direction was wrong and the unfortunate Jake rammed his head into the wall with a force that created something more or less than six million stars and comets scintillating before his eyes. With a yell of pain he turned and made another dive in the opposite direction, only to bring up against the corner of the table and go sprawling headlong to the floor. Determined to sell his life dearly, however, he rose once more. Ahead shone a faint glimmer of light, and suddenly realizing he was standing before a window he ripped off the shade with one stroke, threw up the sash and leaped out with a whoop like that of a Comanche Indian, landing on his back on the ground several feet below. There he lay gasping for breath and thanking his lucky stars for such a miraculous escape.

Following closely behind him Ezra catapulted through the open window, finally free from the tenacious embrace of the screaming fair one. With a resounding thud his feet found a resting in Jake's abdomen, and the two rolled over in a struggling and gasping heap.

But the excitement was not confined to the library alone. Mrs. Marsh, the secretary of the women's club and a dour, fiery-haired Amazon, had wearied of the wireless set and had gone into the kitchen to see how things were progressing in that quarter. When the lights went out, following close on the scream of the spark, she instinctively knew that all in the library were being electrocuted, and dropping an armful of chinaware to the floor, she ran out into the hallway, howling emphatic appeals for mercy at the top of her voice. Caught up in the mad rush of the dancers, she was twisted and turned and finally ejected out of the door along with the rest.

For a few moments after the accident

Bob was nonplused. He knew that what ever had gone wrong had certainly not been caused by a kickback, for he had carefully seen to it that morning that the needle-point gaps were properly connected. Suddenly he remembered the fuses. Rushing out the back door to the wagon and hunting around for a minute for a screwdriver and a piece of wire, he demanded a box of matches from Spunk, who was still sitting in the wagon, petrified with astonishment.

Bob vaguely recalled having seen the meter and fuses somewhere in the hallway. He struck a match and ran in what appeared to be the proper direction. There they were, and it took but an instant for him to climb on a chair and by the light of several more matches set a piece of wire across the blown fuse.

Immediately the lights glowed again as bright as ever. The crowd, now greatly increased, and headed by Mrs. Marsh and the angular president, Miss Reed, surged back again like a wave. Bob retreated into the library with the angry president and secretary in pursuit.

The crowd halted at the door, none caring to venture further. "I thought you told us that this awful thing was so perfectly safe!" began Miss Reed, "you fiend incarnate, you almost killed all of us! Why did you start that deadly machine? You've scared everyone half to death!"

"Yes, and you made me drop a whole armful of dishes," chimed in Mrs. Marsh. "You will most certainly have to pay for everyone of them! and don't you ever dare to bring any wireless machine or any other kind of machine, in here again. Just so soon as this dance is over, you get your stuff into your wagon and get right out of here!" She glared at the young experimenter maliciously.

"No harm has been done at all, ma'm," said Bob, mustering up his courage bravely, "only a fuse was blew out—that's all."

"No harm done, eh?" exploded Jake from the edge of the crowd around the library door. "I reckon this ain't no harm, is it?" and he tenderly rubbed a large swelling on the top of his head. "And where Ezry Pratt jumped in the middle of my front and pushed it clean

She instinctively knew that all in the library were being electrocuted

to the back, ain't no harm neither?" Becoming bolder he cautiously stepped inside the door and began an examination of the surrounding wall.

"What's that!" broke out in Miss Reed's high treble. "What are you looking for?"

"What'm I lookin' for?" repeated Jake, belligerently. "I just a-happen to be lookin' to see if I didn't make a dent in the wall; tryin' to get outa here I hit it like a pile-driver."

Miss Reed turned away. "Never mind, don't bother looking," said she. "If there is a dent there these young rascals will have to pay for it!"

Bob assured them that there would be no further trouble now that everything had been fixed all right, and to prove to them that this was so, he started the rotary gap again and pressed the key. Promptly the fuse on the other side of the line blew out and plunged the hall into darkness.

"I knew it! I knew it!" yelled Jake, as he galloped down the hallway to the open air, closely followed by the panic-stricken crowd.

The hall was emptied in an instant. "Isn't it perfectly dreadful!" gasped Mrs Marsh; and the breathless assemblage reflected the horror in her eyes.

"That terrible machine will kill us all yet!" wailed Miss Reed.

"And it's spoiling the dance entirely!" came in petulant tones from one of the younger set.

Meanwhile Bob was very active. When

he saw the result of the second attempt to operate the set he stopped just for an instant to tear loose the wire from the condenser, and rushing out into the hallway climbed up on the chair and placed a piece of wire across every fuse in sight; and not satisfied with that he put wires across the meter as well. Everything then to his satisfaction, he went back to the library, determined to make another attempt. But by then the assemblage had recovered its mental balance and fright had turned to indignation; he was excitedly commended to take up the wireless set and clear out at once.

"Don't you dare start that thing again!" cried Miss Reed, backing away from the door as the rotary gap commenced slowly to revolve. "It will be all right this time," said Bob convincingly. And so it was! The lights looked as if they would go out, but when they had flickered down to a dull red they stayed that way until Bob let go of the key, when they flashed bright again. Everyone was greatly relieved and the curiosity of the newcomers offset the fears of the others. Although they still feared the terrorizing spark, it proved to be the main attraction. The library was kept jammed full; the crowd changing about every twenty minutes and keeping Johnny busier than ever before in his experience, raking in the quarters, literally by the handful.

When ten o'clock came everything was going smoothly and steadily and the boys began to think of themselves as on the high road to fortune. Downstairs, grouped about the front steps, a group of the older men were discussing the marvels of modern invention. Suddenly their thoughts were turned from wireless telegraphy to another great scientific achievement, the automobile. Most of their knowledge here, too, was based on hearsay; no one in Bingleton owned a machine. Therefore, great was the speculation as two headlights drew nearer and nearer and a powerful car thundered to a sudden stop in front of the hall.

Two stylishly dressed young men descended and with careless nods passed through the door. It was Clyde and his friend, and neither in particularly good humor. They had been delayed by three punctures and a blowout. Nothing at, in, or near, Bingleton looked good to them.

"Two," snapped Clyde, presenting himself before the ticket window, which was merely an opening in the wall between the library and hallway. Johnny handed out two tickets and stared curiously at the boy before him. There was something ominous in that air of assurance, and for the first time in the course of the evening the treasurer became embarrassed. He mixed up the change hopelessly; Clyde became impatient on the third recount and airily waved aside the shiny coins which were due him. Great was the amazement of the curious bystanders. So unused to this type of indifference was Slim, he remained gaping in the doorway as the tickets proffered him dropped from his nerveless hand.

The room was packed and the two young men elbowed their way to the table with some difficulty. For a minute they stood side by side watching the operation and saying nothing. Bob was droning on for the steenth time with his explanation of the phenomena that made the Honolulu signals audible. His hearers were visibly impressed and the lecturer stopped for an instant to let the weight of his words sink in. It was an unfortunate pause. His eye caught the amused twinkle in Randolph's.

Assuming a boldness he did not feel, Bob inquired: "Is there any information you would care to have?"

"Yes; there is one thing you can tell me," responded Randolph. "Where on earth and how in the world did you man-

age to get together such an extraordinary collection of junk?" his voice ringing out clear and sharp with a note of accusation.

As one, the crowd turned to Bob. He was speechless; somehow he felt that it was all up.

"Here, let me listen to those signals from Honolulu you're talking about!" continued Randolph, taking the receiver from the hand of an astonished rancher. Five seconds later he put it down and an expression of disgust swept over his countenance. "Here, listen to this," he said as he handed the receiver to Clyde.

Clyde listened scarcely a moment when he threw it down with the exclamation, "Fake!" and rapidly ran over the piled up instruments until he located the two buzzer wires leading off behind the bookcase. Looking meaningly at the assemblage he followed up this clue and disappeared through the back door, tracing his course by the aid of a flashlight. An instant later the flash discovered Spunk sitting quietly in the wagon seat, peacefully rubbing the wires together and all unconscious of the impending calamity.

"Why, this is the biggest bunco I ever ran into!" broke from Clyde as he made a precipitous return to the room. "They have a fellow outside there who has been making all these signals with a buzzer hidden around here somewhere," and his eyes swept hastily about the library. "And as for this," and he pointed derisively at the outfit on the table, "it's nothing but a cheap bunch of home-made junk, nothing at all like a really good wireless set!"

With the speed of a prairie fire his denunciation spread through the hall and an angry murmuring arose on all sides. The ambitious amateurs who had sponsored the show, dumbfounded at first, were among the earliest to recover their presence of mind. Everybody present and the greater percentage of those out on the dancing floor had paid to see the wireless demonstration. It was time to get away in a hurry. And just as this thought broke upon all the boys simultaneously, an angry murmur arose from the people they had tricked.

Bob showed himself the little general again. Without attempting any explanation, he faced the crowd and told those in the room that if they would go out into the hallway and pass by the ticket window he would give them all their money back.

But his hearers in the library did not move. From the hallway and elsewhere the threatening murmurs swelled in volume and began to take the form of suggestions as to proper punishment for the hoax. The advance guard of the angry crowd began to press towards the table.

'Lectricity Bob stood firm. "Get out!" he screamed. "If you don't get out right away, I'll set the spark after you and kill every one of you in a second!" Assuming a most threatening attitude, he reached forward and started the gap motor.

An ink bottle smashed against the wall an inch above the frantically bobbing red head

It had the desired effect. Hardly recovered from the fright of earlier in the evening, and certain that if the spark was released it would instantly reduce the hall and everyone in it to a pile of ashes, the throng turned as one and fought their way into the hallway, some of them clapping their hands over their eyes to shut out the awful death-dealing shriek which was to come. In a second the library was emptied of all save the two young men from Santa Rosa.

"Smart bunch of young fakers, aren't you?" said Clyde with a sneer.

Spunk had been witnessing the proceedings with inward fear and trepidation, although he preserved a brave front. The supercilious smile on the visitor's face, however, proved too much for him. "Get out," he shrieked vindictively, and emphasized his command by hurling a heavy dictionary with perfect aim. Down went Clyde in a heap, and in an instant they had forced him through the doorway on the heels of his friend's retreat.

Quick as a flash Bob slammed the door shut and locked it. "Here!" he cried to Johnny, "take all the money and get out into the wagon right away!" And turning to the other three: "You fellers have to help me pack the transformers out to the wagon —an' be quick!" Unthinkingly they obeyed and together carried the heavy transformer out of the room, while Bob followed with an armful of instruments, dumping all into the wagon. He ordered Slim and Fred to untie the colts and face them toward the road; then calling Spunk to follow he returned for the bottle condenser and the rotary gap.

With the latter instrument tucked safely under his arm, Bob started back to the wagon. Attempting to salvage as many of the condenser bottles as possible, Spunk still delayed in the library. The crowd in the hallway, tricked and then derided by mere boys, was now unmanageable; they were kicking and pounding on the door in a way that left it but a question of moments when it should leave its heavy oaken frame. Mrs. Marsh was frantically, but vainly, attempting to climb in through the ticket window.

Spunk set down his bottles and reached for an armful of magazines, sending them flying in that general direction. Nothing daunted, Mrs. Marsh came on, gasped, and then jammed fast in the ticket window; there she remained, screaming out demands for him to cease his work of destruction. By way of answer an ink bottle flew from Spunk's hand and smashed against the wall an inch above the frantically bobbing red head. Then, grabbing up as many of the condenser bottles as he could carry, he dashed out to his waiting companions.

Spunk industriously began tossing over the tailpiece the precious condenser bottles

The colts started off with a gallop, grazing the corner of the hall and ripping loose a shower of splintered wood. A cry arose from within, and the irate Bingletonites poured through

the doorway to take up the pursuit in the darkness.

On dashed the wagon, rocking and swaying along the rutty road. . . . There came a time when the boys thought they were safe from pursuit and at a word from their leader the colts were pulled down to a walk. Scarcely had this been done when an ominous roar arose out of the darkness, increasing in volume with marvelous rapidity.

"It's that smart Aleck's automobile! They're goin' to run into us!" yelled Spunk, as the big headlights rounded a bend in the road and began bearing down upon them. Bob grabbed the reins and urged the colts forward to their greatest speed, Fred and Slim aiding by pelting them with a few of the detectors. At the back of the wagon Spunk industriously began tossing over the tailpiece the precious condenser bottles, carefully observing that each one landed in the center of the road.

In an instant there was a loud report, followed by two short and sharp ones. A stream of dirt and stones shot up in front of the headlights and a grinding, crashing sound was heard as the beams of the powerful lamps suddenly disappeared over the brim of the ditch and were extinguished against a picket fence on the opposite rise.

"We're killed, they're shooting!" screamed Fred.

"Shootin' — you fool!" shouted Spunk. "It's nothin' but them broken condenser bottles—they got three tires!"

. . . .

Five minutes later the wagon was peacefully jogging along the road to Hamsville. Not a sound had been uttered in the intervening period. Then:

"I've got moren'n forty dollars here," said Johnny; a muffled jingle came from his coat pocket.

"Gee!"

And the wagon rolled steadily on, a frog croaked, a whippoorwill chirped and five minds instantly turned toward new fields to conquer.

TO TIME RACES BY WIRELESS

Wireless timing will be employed at the annual regatta of the Mississippi Valley Power Boat Association at Hannibal, Mo., July 5, 6 and 7. Association officials have been authorized to purchase the necessary equipment and all of the big events will thus be timed by the most accurate known method.

This system of timing was tried out at Buffalo last fall and it was found there was a difference of one second or more to a mile between the wireless and the old system of sight timing. The wireless is absolutely instantaneous and the racing men will get the benefit of every factional part of a second of speed made.

With some of the greatest boats in America scheduled to appear at Hannibal, including Commodore Pugh's Disturber IV, Johnson Brothers' Black Demon IV, and Commodore Blackton's Baby Reliance, there is every reason to expect a new world's record for fresh water will be established.

IN HONOR OF MORSE

More than 100 old-time telegraphers, retired and still in active service, met at the Seattle Press Club, on April 27, and paid honor to the memory of Samuel Finley Breese Morse, inventor of the telegraph, who was born on April 27, 1791. In addition to commemorating the birthday anniversary of the man whose invention now performs a prodigious share of the world's work, the gathering was also given an opportunity to live over experiences of the days when each of them "sat in" on some "fast" wire and devoted himself entirely to reading the mysterious clicks of the sounder. J. R. Irwin, superintendent of the Northern District of the Marconi Wireless Company and president of the Dot-and-Dash Club, under whose auspices the meeting was held, presided as chairman.

The Dot-and-Dash Club, formed two months ago, received more than twenty-five new members during the course of the meeting. The organization plans to hold meetings regularly.

BOOK REVIEWS

LIST OF RADIO STATIONS OF THE WORLD, *by F. A. Hart, Chief Inspector, Marconi Wireless Telegraph Company of America, and H. M. Short, Resident Inspector, New York, Marconi International Marine Communication Co., Ltd.*

Realizing the growing demand for a modern, up-to-date and complete list of radio telegraph land and ship stations, Inspectors Hart and Short have compiled such a list from the latest available information, largely from sources inaccessible to the general public. The volume is a distinct advance on any similar work which has been published and the arrangement of the material is distinctive.

Part One contains an alphabetical list of Call Letters from AAA to ZZZ and the vessels and land stations to which they have been assigned. Naval vessels are shown in italics and coast stations in small capitals. Where call letters have not yet been assigned spaces have been left so that the ship or coast station may later be filled in.

Part Two is a list of naval stations arranged alphabetically by station and country.

Part Three is an alphabetical list of commercial ship stations showing call letters, ownership, control and nationality, forming a ready reference with Part One.

Part Four is a list of land stations arranged alphabetically by station and country.

So comprehensive and convenient is the scope of the work the Marconi Company has already ordered a number of copies for the ship and shore stations under its control.

The book is strongly bound in cloth and is built for service. The price is $1.00 net, postpaid, from the Book Department, Wireless Age.

A WIRELESS RECEIVING SET FOR TIME SIGNALS. *By Austin C. Lescarboura.*

A monograph published in the interests of Brandes' receivers, this description of an inexpensive jeweler's set purposes to make possible the construction of an equipment for tradesmen who have been unable to secure the advertising benefits of accurate time service owing to the prohibitive cost of manufactured instruments. Moderate skill in the use of simple tools, an outlay of twenty or twenty-five dollars and careful attention to the directions given should produce the set described; one adequate, it may be said, for the ordinary uses of trade for which it has been prepared.

ECONOMICS OF BUSINESS. *By Norris A. Brisco.*

For the serious-minded amateur and the commercial operator who looks to the higher executive positions in the wireless field, this book offers many opportunities for profitable study. The principles on which the great international structure of business are founded are generally a closed book to the aspiring youth and, no matter how hard he may try to understand, many years pass over his head before his business environment brings him in touch with structural things. For broad-gauged vision and understanding the best studies are those directed to the methods of successful business enterprises. What successful business men have to say of their own experiences is valuable information, if properly analyzed. And these two methods the book has combined in placing between its covers a surprising amount of information. This is not a work on wireless telegraphy, but it is one that every one engaged in the field can read with profit, particularly those who seek a business career in the radio field, rather than a scientific one. Price, $1.50, from the Book Department, The Wireless Age.

HOW TO PASS U. S. GOVERNMENT WIRELESS EXAMINATIONS. 118 ACTUAL QUESTIONS ANSWERED.

This volume, which was prepared under the editorial direction of The Wireless Age, should have a place on the table of every wireless enthusiast. As its title indicates, it was written especially to supply the needs of those who contemplate trying the government wireless licenses examinations. The book can be obtained from the Marconi Publishing Corporation, 450 Fourth avenue. Price, 50 cents.

From and For those who help themselves

Experimenters' Experiences.

The Editor of this department will give preferential attention to contributions from amateurs covering the design of transmitting sets, wave-meters, etc. There is an over-supply of material on receiving tuners, particularly "loose-couplers," the designs for the majority of which present nothing new or original.

FIRST PRIZE, TEN DOLLARS

A Receiving Detector of High Efficiency

On account of the erratic action of the galena detector and general unreliability many amateur experimenters are compelled to resort to a less sensitive mineral. It is rather disagreeable to have a detector "go dead" right in the midst of a message because you happen to lay your arm on the table or perhaps move the receiving tuner.

The following described detector retains the high degree of sensibility of the galena detector, but practically never goes out of adjustment. In outward appearance it is much similar to a Marconi coherer.

Two plugs, made of a strip of tinfoil 3 inches in width and about 2 feet in length are inserted in the ends of a glass tube, the diameter of the plug, of course, depending upon the diameter of the tube. The roll is then cut in half to provide two plugs. One end of each roll is filed smooth and the other end flattened in a vise and bored with a 1/8-inch hole through which is passed a small brass bolt to fasten it to the standard. A general idea of the manner in which it is constructed is shown in the accompanying diagram.

The plugs are separated by about 1/4 inch and the intervening space is a little more than half filled with equal amounts of finely powdered galena and silicon scraped with a knife from the solid material. The amount in proportion of the constituents may be varied by the experimenter. In the detector built by the writer a small amount of pyrites was also used. The adjustment is effected by simply revolving the glass tube and regulating the potentiometer. The instrument is connected up as any other current-using detector. The accompanying diagram gives exact dimensions of all parts. Owing to its extreme simplicity the detector can be made by anyone in half an hour. The high efficiency of this detector is due to the great number of sensitive points formed by the finely divided particles.

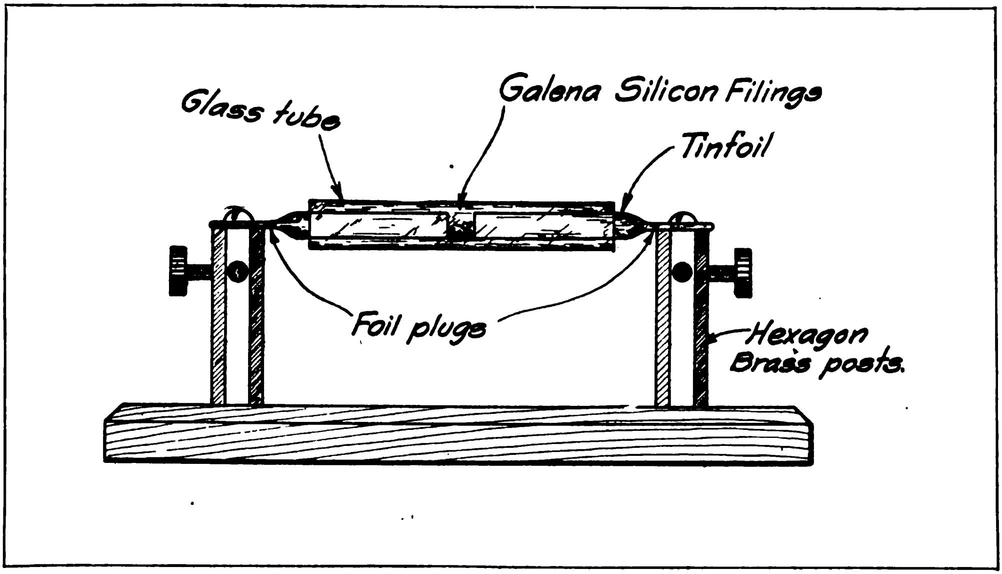
The detector may be handled while in operation without interfering in the slightest with the receiving. The writer has even by way of experiment pounded with a hammer on the operating table, while listening in, and aside from the momentary disturbance set up, the message continued clear and distinct.

(Name and address of contributor not given.)

SECOND PRIZE, FIVE DOLLARS

Zinc Spark Gap Electrodes

One of the problems the wireless experimenter encounters in the design of a transmitting outfit is the construction of



Drawing, First Prize Article

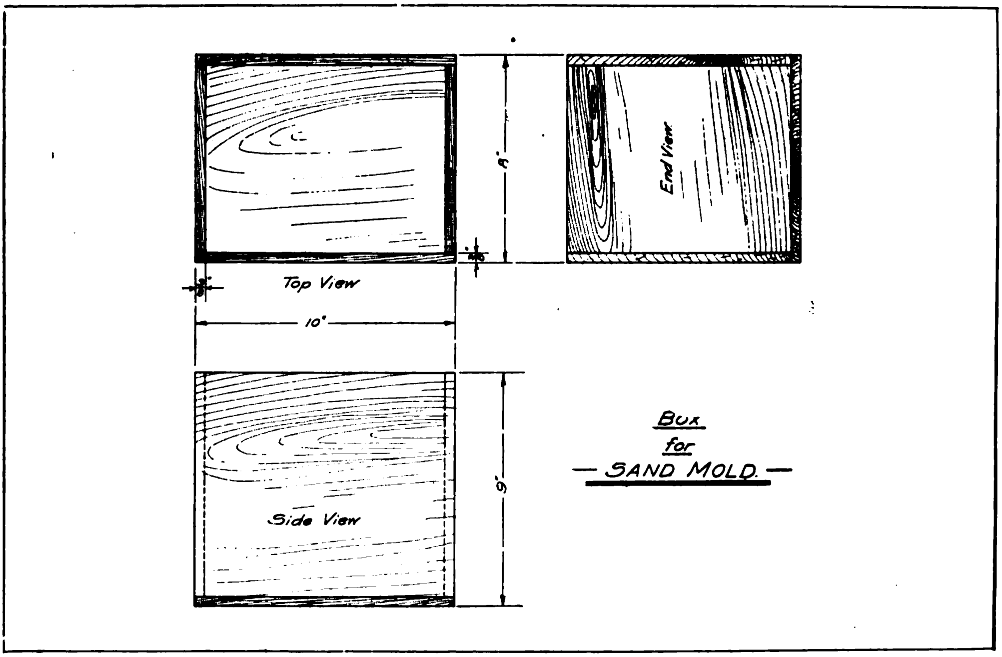


Fig. 1, Second Prize Article

a satisfactory stationary spark gap. The average amateur spark gap has electrodes so small that they will not accommodate the discharge of the average spark coil or transformer, thus causing a loss of efficiency through heating. If the dimensions of these spark gap electrodes were increased even for a small coil, the radiation of the set would increase correspondingly. For satisfactory conduction and radiation of heat, the cooling fins of a stationary spark gap must be

cast integral with the spark electrodes. It is sometimes difficult to purchase zinc rods 1⅛ x 1½ inches in diameter from which to turn large electrodes with radiating plates, but I have found it very easy to melt up scraps of zinc and run the molten metal into a sand mold somewhat larger than the electrodes you desired when finished.

The scrap zinc must be cleaned by scraping away any chemical formation, and then melted in an iron crucible. The crucible may be placed in an ordinary furnace until the metal appears molten. The sand mold can be made in any convenient box, somewhat similar to the dimensions of the box shown in Fig. 1.

The dimensions of the pattern in which form the zinc is to be cast may be changed to suit the individual requirements, but for all types of spark gaps up to ½ kw. the pattern need be no larger than 1½ inches in diameter, as shown in Fig. 2. The casting must be fairly long, at least 7½ inches, to allow it to be turned in a lathe conveniently.

It is very important to allow a slight draft on the pattern so that it may be drawn from the sand without breaking the mold. The draft may be seen in Fig. 2. Place the pattern in the box and pack the moistened sand tightly around it. Draw the pattern carefully from the sand by means of a hook, A, Fig. 2.

The molten metal must be cleaned, so that it is best to skim the surface of all impurities with an iron ladle. Be sure that there is enough metal in the crucible for the entire bar, for the mold must be made at one pouring. Then pour the metal in the mold very slowly. It is upon this process that the success of the casting depends, for if the metal is poured too fast the casting will be full of air holes and worthless for spark gaps.

Allow the casting to cool and take it out of the sand. It is then placed in the lathe and turned to 1¼ inches diameter and then finished to 1⅛ inches in diameter. Fig. 3 shows the dimensions of the electrodes for use on spark coils or small transformers.

A casting of this size will conveniently allow two sets of electrodes so that the time and trouble will easily be repaid to the experimenter building a good spark gap.

JOHN E. BRADY, *Maryland.*

THIRD PRIZE, THREE DOLLARS

A Compact Receiving Tuner

My receiving set is compactly enclosed in a mahogany case 19 inches in length, 14 inches in height and 9 inches in width. The detecting apparatus and other instruments are mounted on a slab of polished fibre.

The complete apparatus also comprises a variometer like that described in the June, 1914, issue of THE WIRELESS AGE, by J. L. Munger. I do not, however, use this instrument as a variometer but employ it as the oscillation transformer of a receiving tuner.

In the instrument described by Mr.

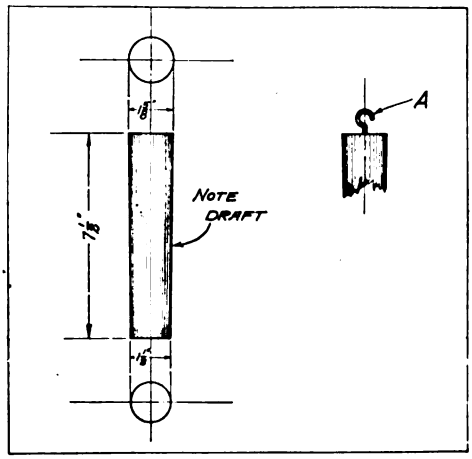


Fig. 2, Second Prize Article

Munger the tubes on which the windings were made were two inches in width, but I have increased the dimensions to 3½ inches in width, leaving the diameter the same. With this arrangement I am enabled to receive longer wave-lengths than would be possible with his design.

The inner tube, of course, is a little less in width so that it may revolve freely. The rod for varying the coupling between the two windings has been extended so that a pointer may be attached on the outside of the case. The variation of the inductance is obtained by means of a 10-point switch for the primary winding and a similar switch for the secondary winding. On each switch one tap represents ten turns of wire; therefore 9 taps represent 90 turns of wire; the remaining taps represent the remaining number of turns.

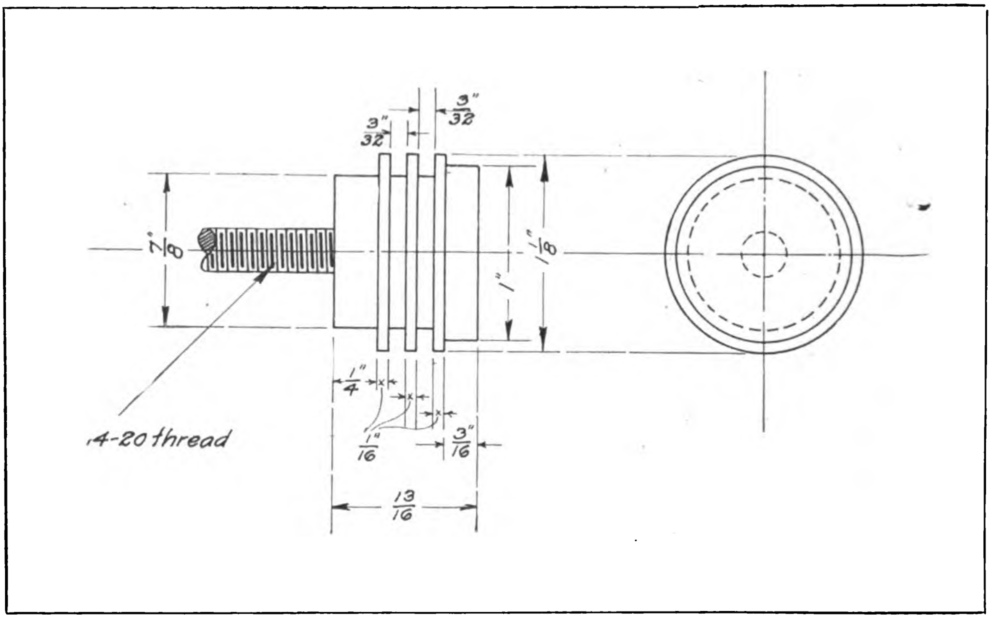
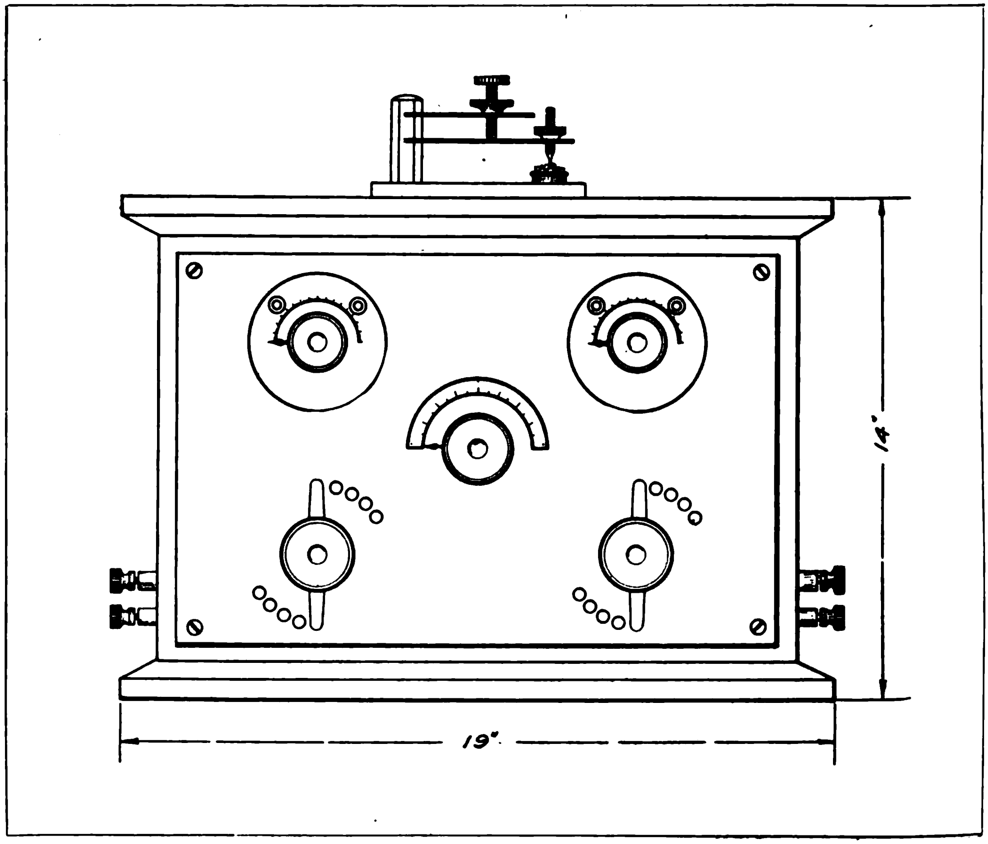
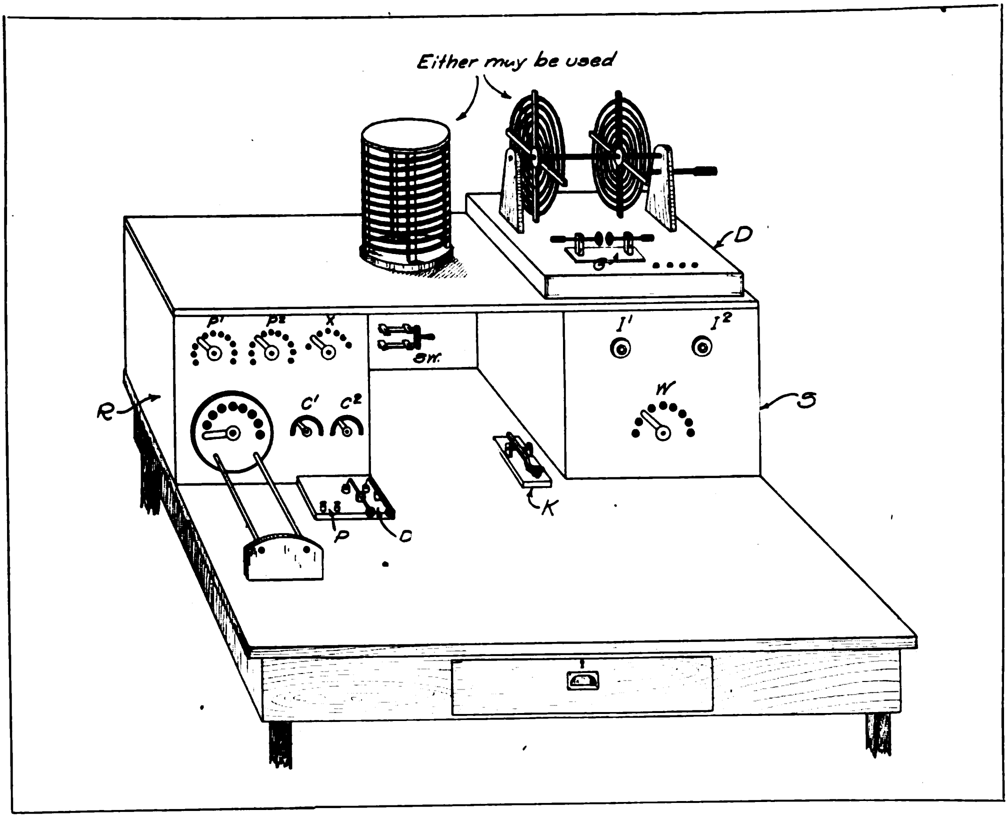


Fig. 3, Second Prize Article



Drawing, Third Prize Article



Drawing, Fourth Prize Article

In order to effect close tuning I prefer two variable condensers of the Clapp-Eastham Company's type as they are suitable capacities, small in size and easy to mount. The detector I use is of the "Ferron" type but galena with a fine wire arrangement may be used. I have found the latter arrangement works very well and the detector stays in adjustment for a considerable length of time.

The detector is mounted on the top of the cabinet, being independent of the other instruments. I am using Brande's Superior receivers and a small condenser for same.

My chief aim in building this set was to produce one which had a neat appearance and could be operated with convenience, and I am quite sure that amateur experimenters building one of similar design are bound to be satisfied.

W. SOLBERG, *New York.*

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE

A Compact Amateur Wireless Set

In looking over the photographs of certain amateur wireless telegraph stations I notice that many experimenters have their instruments scattered all over the table. This state of affairs, I believe, is destructive to the general all-around efficiency of the set, and I am certain that it destroys the appearance.

I, therefore, wish to suggest a design for a compact transmitting and receiving set which I trust will meet with the amateur's approval. A general layout of the equipment is shown in the accompanying drawing, the transmitting apparatus being mounted to the right of the cabinet, the receiving apparatus to the left. I have given no specific dimensions for the various parts of the equipment, my drawing simply being intended to show the manner in which the apparatus may be assembled.

The front of the receiving cabinet is preferably made of hard rubber, although hard wood, which has been given two or three coats of shellac, blackened with lamp black, will serve the same purpose.

The receiving transformer may be of any size desired, the primary taps being brought out to the two switches, P1 and P2. The receiving condensers, C1 and C2, may be of any make suitable for the purpose and should be mounted as shown.

A switch for the taps of a loading coil placed on I1 and the helix either over it or perhaps better to the left of D.

The amateur will find it much easier to tune down to the 200-meter wave owing to the absence of long leads which are required when the apparatus is scattered about the table.

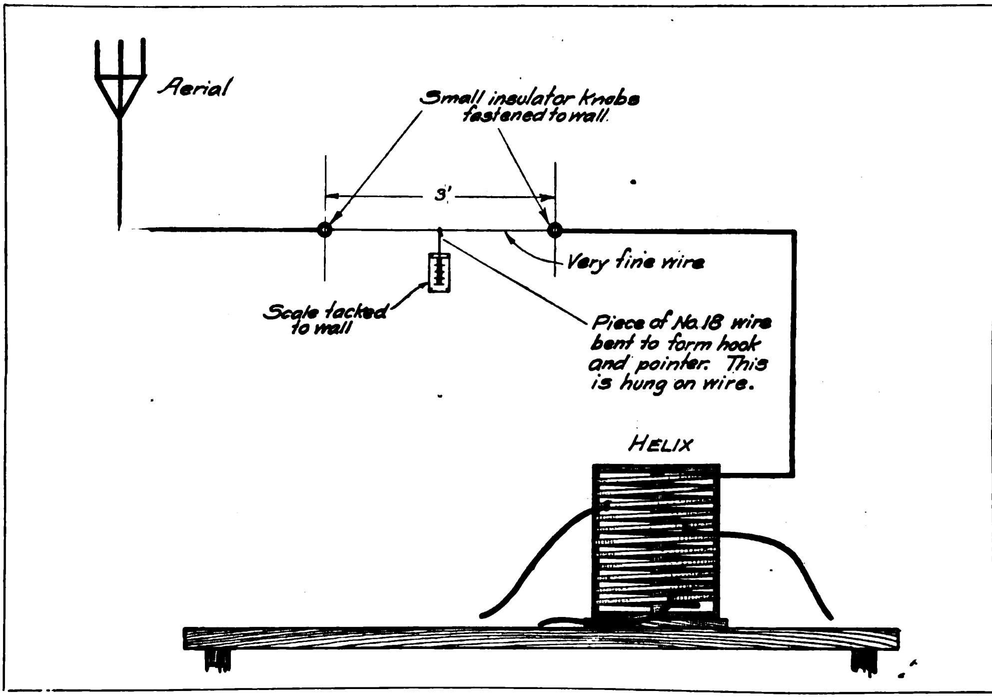
FRANCIS STRUTHERS, *Massachusetts.*

HONORARY MENTION

A Cheap Hot-Wire Meter

A great many amateurs when they come to tune their transmitting apparatus find that they are badly in need of a good hot-wire meter, but after consulting with their pocketbooks they are forced to abandon the idea and do without. The meter shown in the accompanying drawing will work as well as any on the market for this kind of work, as the essential thing is not to know the *number* of amperes sent out, but to know *when* you are sending the most.

I have used a meter of this kind very successfully to measure the output of a one-inch coil, using No. 40 copper wire for the hot wire. The size of the wire used depends on the power of the set, varying from No. 40 for small spark



Drawing, Honorary Mention Article, F. C. Beckley

is indicated at X. Two or three detectors, having a multiple point switch so that any one may be used as desired, may be mounted on the detector stand, D. The telephones are connected to the binding posts at P.

The position of the change over switch SW, and the key, K, are clearly indicated in the drawing. The sending apparatus, S, contains the transformer from which the secondary terminals are brought out to insulators I1 and I2; the primary taps are brought out to a switch, W. The sending condenser, D, may be placed over the sending apartment, while the spark gap, G, is

coils, to No. 28 or 30 or even larger, for transformers. The proper size of wire to use can best be determined by experiment. If Climax or other resistance wire be used the hot wire may be very much shorter.

In operation the wire heats and expands, allowing the pointer to descend over the scale. If this movement be over ½ inch, a larger wire should be used. The pointer should not weigh over ¼ ounce.

F. C. BEEKLEY, *Pennsylvania.*

HONORARY MENTION

A Hint for Selecting Galena Crystals

I have found a method for selecting a sensitive galena crystal, which I have never known to fail. I find that it holds good for all types of galena crystals and I believe that the amateur making use of my advice will be saved considerable useless experimenting.

Galena crystals with a flat surface without a flaw on them are invariably found to be worthless. A sensitive crystal has a ruffled surface and the sensitive spots can generally be located in this vicinity. This test is facilitated by means of a buzzer. I might advise that this ruffled surface generally appears near to a sharp edge of the crystal.

FRED CARLSON, *New York.*

CHANGE IN MESSAGE ORDER

The Marconi Wireless Telegraph Company of America has called attention to the fact that the following is to be substituted for Paragraph 6 of the Navy Department's instructions regarding the enforcement of the order of President Wilson concerning wireless communication:

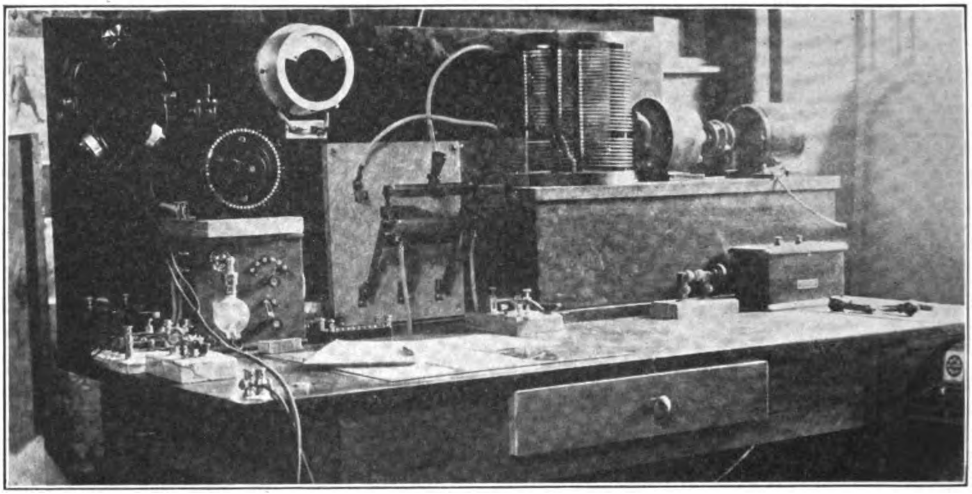
"Code or cipher messages are permitted between shore radio stations entirely under the jurisdiction of the United States and between United States shore stations and United States or neutral merchant vessels or neutral shore stations, provided they are not destined to a belligerent subject and contain no information of any unneutral character, such as the location or movements of ships of any belligerent nations. In such messages no code or cipher addresses will be allowed except those registered prior to July 1, 1914, and certified copies of which are filed at the United States radio station through which the message is to be transmitted. All messages must be signed either with the sender's name or with a duly certified registered name complying with the requirements for registration of address. Radio operating companies handling such messages must assure the government censor as to the neutral character of such messages. Such messages, both transmitted and received, must be submitted to the censor at such time as he may designate, which will be such that will not delay their transmission."

The paragraph in question originally declared that: "In such messages no code or cipher addresses will be allowed and all messages must be signed with the sender's name. Radio operating companies handling such messages must assure the government censor as to the neutral character of such messages. Such messages both transmitted and received must be submitted to the censor at such time as he may designate, which will be such that will not delay their transmission."

The Marconi Company has also called attention to the closing sentence of Paragraph 4 of the Navy Department's instructions. The paragraph is as follows:

"No cipher or code radio messages will be permitted to be sent from or received at any radio station in the United States via any foreign radio station of a belligerent nation, except from or at certain stations directly authorized by the government to handle such messages. Press items in plain language relating to the war, with the authority cited in each item, will be permitted between such stations, provided no reference is made to movements or location of war or other vessels of belligerents."

With the Amateurs



Station of A. M. Lindsay, Jr., Rochester, N. Y.

Experiments have been conducted by the wireless society of Tufts college, in which the messages were transmitted and received without the use of aerial antennae. The results of the experiments show the best results from the use of the ground antennae were obtained when the receiving wires were laid in a direct line with the transmitting station. Two ordinary wires, 90 feet in length, were found, when stretched on the ground in this manner, to be sufficient in receiving messages from points 50 to 75 miles distant.

The Capitol City Radio Club is one of the latest additions to the ranks of wireless amateurs. It was organized with eighteen members on March 6, in Washington, D. C. B. S. Flather is president; C. Godfrey, vice-president; E. French, treasurer; J. Gamble, recording secretary, and S. Culverwell, financial secretary. A one-half kilowatt transmitting set, the property of the president, has been designated as the club's central station.

The Wireless Association of Pennsylvania has been conducting extensive tests with the Armstrong circuits for the valve detector, and at the meeting of June 8 a review will be held consisting of the results of tests presided over by Malcolm Ferris. At the meeting of June 25 a talk will be given by G. W. Garvin and E. C. Andrews on oil condensers.

The May meeting of the Radio Club of America was held on Saturday evening, May 1, in Fayerweather Hall, Columbia University, New York. Paul F. Godley spoke briefly on activities in radio work on the Pacific coast and presented a most interesting and instructive paper on "Methods of Measuring the Intensity of Incoming Signals." The paper was illustrated by instruments and circuits used in these quantitative measurements. Mr. Godley also demonstrated the use of some recently developed oscillating valve circuits and many interesting signals were received during the meeting.

Marconi Men

The Gossip of the Divisions

Eastern Division

J. A. Worrall and R. H. Poling are serving on the St. Louis of the American Line as senior and junior, respectively. Worrall has the distinction of being one of the first of the few operators to secure an extra first-grade license.

R. Duna is now on the Colorado. The operator previously assigned to her was suspended for leaving the vessel after reporting on board sailing morning.

W. F. Dillon has been assigned to the Guantanamo, a one-man ship.

R. C. Cuthbert is no longer in the service.

J. Keinast, formerly of the Southern Division, is now attached to the John D. Archbold.

Walter Neumann of the Southern Division has been assigned to the Texas at Philadelphia.

D. Levin is another of the Southern Division operators to be assigned to a ship of this division. Levin relieved L. M. Burt on the Louisiana.

N. W. Bard has resigned.

L. M. Burt, formerly of the Port Arthur station, is now senior on the Parima.

C. S. Thevenet has been promoted and is now first on the City of Columbus. G. R. Gould takes his old post of junior on the Apache.

Sidney Giffin was relieved by C. C. Short on the Gulflight before she left New Orleans on the voyage on which she was torpedoed.

W. V. Moore has been assigned to the steam yacht Alberta.

W. Travers and C. T. Hiller have been assigned to the El Rio as senior and junior. Hiller was formerly attached to the Gulf Division.

R. H. Fleming is now in the Gulf Division, having been assigned to the San Juan as junior a few weeks ago.

M. A. Luedtke has been re-engaged and is now attached to the Mexico, of the Gulf Division.

R. P. Woodford is now attached to the New York of the American Line as junior. Woodford was formerly attached to the Trans-oceanic staff.

C. B. Darcy, who was senior on the Seminole when she went aground in the tropics a few weeks ago, is now attached to the Bantu.

J. M. Harrison has been temporarily assigned to the Virginie of the French Line.

A. J. Minners and E. Bambourakis, senior and junior of the Finland, have the distinction of being the first operators to take that vessel through the Panama Canal. The Finland is bound for San Francisco.

W. W. Rich is now attached to the steam yacht Corsair.

James R. Joiner, of the Marconi School of Instruction, has been assigned as second on the Florizel. T. A. Tierney, the senior, was the only operator on board while the Florizel was seal hunting in the ice fields.

W. A. Hutchins has returned to the Great Lakes Division. His place as junior on the Tennyson was taken by H. A. Carder.

Stanley Russell and G. Nolan have been assigned as first and second on the Satsuma. Russell was second operator on the Seminole when she went aground in southern waters. Nolan is fresh from the Marconi School of Instruction.

J. R. Conway is now senior on the Philadelphia of the Red D Line. C. Murray takes his former detail as junior on the Momus.

A. E. Smith has relieved E. N. Pickerill as senior on the Creole. Arthur Cohen takes the place vacated by Smith on the City of Montgomery.

L. C. Nunn is now senior on the Huron.

H. E. Cohen is senior on the Relay, which has just been placed in commission. Henry Markoe is junior.

Alex Schneider is first on the El Oriente.

The steamer Clan MacIntyre has been equipped for the English Marconi Company. L. T. Barker and W. E. Bisgrove have been assigned to her.

W. S. Weatherbee has relieved J. A. Johnson on the Alabama.

The Sarnia of the Atlantic Fruit Company has been equipped. A. Darlington and W. A. McDonald are doing duty aboard her.

P. Boucheron has temporarily relieved J. S. Merrill on the Comanche.

The new ship of the Gulf Refining Company, the Gulfcoast, has been equipped with Marconi apparatus. W. S. Wilson was assigned to her.

L. R. Schmitt has relieved L. Brundage as senior on the Morro Castle. Brundage is on sick leave.

A. G. Berg has been promoted to senior on his ship, the Esperanza. W. C. Thompson is junior.

B. N. Lazarus has been transferred to the Alamo.

L. F. Whitehead has been assigned as second to the A. W. Perry.

H. T. Munroe has been assigned to the City of Bangor, which recently went into commission.

Southern Division

W. E. Newmann was recently assigned to the Texas at Newport News, Va.

E. P. Hough has relieved H. J. Sacker as senior operator on the Juniata.

D. Levin recently relieved L. M. Burt on the Louisiana at Baltimore. Burt returned to his home in Philadelphia.

C. H. Warner has been transferred from the Dorchester to the Vigilancia at Savannah, relieving Operator Husk of New York. The Vigilancia sailed for Havre, France. The vacancy on the Dorchester was filled by Water Osterloh, formerly of the Merrimack.

J. E. Bell, who made several trips to Providence on the Parthian, has been reassigned to the Howard.

W. J. Phillips was recently assigned to the Parthian as senior operator, J. H. McCauley remaining as junior.

H. H. O'Day has been assigned to the Borgestad, relieving J. R. Lange. J. F. Larrimore was assigned to the Ontario in place of O'Day.

J. R. Lange and E. L. Petit have been assigned to the newly equipped Sibiria as senior and junior, respectively. The Sibiria was equipped at Baltimore with a ½ k.w., quenched gap panel set, by Marconi Engineers Murray and Wyble.

A. Doehler has been assigned to the Cretan as senior operator.

Clement Murphy has been assigned to the Burmese Prince at Newport News, Va., which sails in a few days for Havre, France.

H. Graf, late senior operator of the Kershaw, has been assigned as second trick operator at the Baltimore station in place of S. Cissenfend. Graf has been anxious for a land station detail for some time. R. P. Linderborn has been promoted to be senior of the Kershaw in place of Graf, and L. W. Passano has been assigned as junior.

Marconi Operator Arthur Bernhardt. He received the S O S that sent the Algonquin searching for the lost Prins Maurits

H. J. Sacker has been assigned to the Juniata as senior operator in place of C. R. Robinson.

P. H. Singewald, late senior operator on the Dorchester, has been assigned to the Southerner, at Charleston, S. C. The vacancy on the Dorchester was filled by J. L. Brannan.

Constructor M. C. Morris is equipping the Southerner, at Charleston, S. C., with a ½ k.w., 120-cycle panel set. The Southerner is a sister ship to the Georgiana which was recently equipped at Charleston, S. C., with a similar set.

T. M. Stevens, Superintendent of the Southern Division, E. M. Murray, Chief Inspector, and R. Y. Cadmus, United States Radio Inspector of the third district, recently made a special test of a ½ k.w., 500-cycle, quenched gap panel set on the Juniata, from Baltimore to Boston and return. Excellent results were obtained, the vessel being in communication with Boston, Virginia Beach, Va., Cape Hatteras, N. C., Miami, Fla., and several other important coast stations. On one occasion the Juniata was in touch with Cape Hatteras at a distance of 390 miles in the daytime.

A. Campbell, formerly of the Philadelphia station, has been assigned to the

second trick in the Cape May, N. J., station, in place of Operator Smith.

Operator W. J. Phillips has recently returned from a trip to Genoa, Italy, via South America, on the Palermo. Phillips returned from Italy as a passenger on the America.

Pacific Coast Division

A. W. Baxter, in charge of the East San Pedro station, made a two days' visit to San Francisco on May 10th and 11th.

E. R. Fairley, acting assistant on the Aroline, recently relieved A. W. Baxter at East San Pedro for a few days.

B. C. McDonald, acting as relief for W. L. Baker at Avalon, returned to the Hermosa on April 22nd, Baker resuming charge at Avalon.

D. Duran, formerly in the San Francisco district, sailed on the Nushagak for Clarks Point, April 29th.

C. Mathews recently left on the Kvichak for Nak Nek. Mathews is in charge of the squad this season.

R. M. Bitzer left on the Kadiak for Karluck, April 10th.

A. Seidl was detailed to relieve L. C. Rayment for one trip on Barge 93, beginning the voyage on May 5th.

J. H. Southard was assigned as operator in charge of the Centralia, May 2nd. The Centralia carries one operator.

L. V. R. Carmine and E. D. Bryant sailed on the China for the Orient, May 8th, as first and assistant, respectively.

J. A. Falke, formerly of this division, was returned to the California, vice S. P. Smith, on April 29th, at New York. The California is now on her way to Brazil.

H. W. Underwood was assigned to the Cuzco as assistant, on April 25th. He joined the Cuzco at East San Pedro. E. J. Browne is operator in charge.

D. R. Clemons and P. E. White are acting first and assistant on the City of Topeka.

W. P. Giambruno relieved E. A. Werner as operator in charge of the J. A. Chanslor, on May 10th, at Avon. Werner has taken a short leave of absence on account of ill health.

A. H. Randow, in charge of the apparatus aboard the Dakotan, was transferred to the San Francisco district on May 1st.

G. H. Harvey relieved H. G. Austin as operator in charge of the Honolulan, April 21st.

R. A. Germon, in charge of the Korea, was transferred to the Jim Butler for service in Mexican waters, leaving April 15th.

D. M. Taylor and W. P. Schneider left on the Korea as first and assistant, April 16th.

When the Korrigan III was seized by the Mexicans in the Gulf of California on April 10th, H. W. Everett transferred the wireless equipment to shore at Santa Rosalia, where he is now successfully operating it as a shore station.

I. L. Church was assigned to the Santa Cecilia, April 20th, bound for New York.

J. F. McQuaid is now acting assistant on the F. A. Kilburn.

L. T. Franklin and F. Deckard sailed on the Lurline, April 28th, as first and assistant, respectively.

J. A. Miche and C. Bentley are scheduled to sail as first and assistant on the Manoa, May 11th.

G. F. Shecklen arrived as operator in charge of the Minnesotan, on May 10th. He is now attached to the San Francisco district.

O. Mock and L. W. Stevens sailed on the Northland as first and assistant, May 4th.

C. Bailey of the Oliver J. Olson was transferred to the Pan American at New York, on April 17th. Bailey is to remain in the New York district until a vacancy occurs westbound.

Y. de Bellefeuille and E. J. Des Rosier left on the Peru for Panama, April 22nd, as first and assistant.

N. J. Marthaler recently relieved A. Konigstein as operator in charge of the General Y. Pesqueira. Konigstein obtained leave of absence on account of ill health. He expects to recuperate at the mud baths in the South.

J. E. Johnston and B. C. Springer are acting as first and assistant on the Queen.

F. A. Lafferty was assigned as assistant of the Rose City, April 16th.

N. McGovern joined the Roanoke as assistant, May 10th.

S. J. Morgan of the Leelanaw arrived at Bremen recently.

H. G. Austin and J. M. Flottman sailed on the Siberia as first and assistant, April 22nd.

W. E. Chesebrough relieved O. Wilts as assistant operator aboard the San Ramon, May 3rd.

F. W. Brown is acting assistant on the Santa Clara since April 20th.

George Gerson of the New York district was assigned to the Santa Cruz, on April 10th.

A. R. Short was assigned to the Vance, on April 26th. Shortly after leaving San Francisco the Vance was damaged in the storm, being towed to San Francisco afterward. Operator Short performed his work creditably.

C. T. Nichols relieved E. Smith as assistant operator on the Wilhelmina May 4th.

J. W. Morrow and J. T. Brady sailed on the Wapama, May 1st, as first and assistant, respectively.

Seattle Staff Changes

H. W. Barker has been temporarily assigned as assistant engineer in the construction of the semi-high power station at Astoria and will be engaged in the tuning of the new plant.

A. W. DeSart, foreman of the Construction Department, has resigned to accept the position of assistant radio inspector at Seattle.

H. Linden, who was temporarily relieving on the Spokane, has returned to his berth on the President.

W. J. Manahan, after a short trip to San Francisco, has returned to the Seattle shop.

H. F. Wiehr of the Paraiso is off duty as a result of the lay-up of that vessel.

J. W. Gregg, second on the Paraiso, is assistant on the Admiral Evans.

A. G. Simson, assistant on the Admiral Evans, has been transferred to the Spokane.

G. P. Williams of the tug Oneonta is taking a vacation. H. J. Scott is relieving him.

W. B. Wilson, station manager at Friday Harbor, is receiving congratulations upon the arrival of a daughter.

C. E. Bence, station manager at Juneau, arrived on the Admiral Evans, accompanied by Mrs. Bence, on his way to San Francisco for a short vacation. He has been relieved at Juneau by Gus Lang, senior operator on the Evans.

The next edition of the Service Magazine will contain the announcement of the opening of the new Astoria, Ketchikan and Juneau stations for commercial traffic. Ketchikan is already completed, and first class communication has been established between Ketchikan and Juneau, day and night.

The Astoria station recently made transmitting tests, under the direct supervision of Chief Engineer F. M. Sammis, assisted by Mr. Moir, the engineer in charge of construction, and his assistant, H. W. Barker.

I. F. Julien, who has been acting as Mr. Moir's assistant at Astoria, is returning to Seattle for a short visit, in order to arrange for the removal of his family to Astoria, where he will take up the duties of station manager at the new station.

KEEPING IN TOUCH ON SWAN ISLAND

A notable record of wireless achievements is shown by the reports of the operators in the United States Fruit Company's lonely but powerful station on Swan Island, where, except for wireless, the inhabitants are cut off from the world for months at a time.

Situated in the Caribbean Sea, ninety miles to the northwest of the coast of Honduras, 2,000 acres of coral and sand form Swan Island, which is a peculiarly ideal location for a wireless station. Its perfect isolation makes it secure from interference by other stations and for this one important reason its efficiency is much greater than some stations on the mainland. Eight years ago the United Fruit Company built the plant to act as a clearing house for all the wireless business from its stations in New Orleans, 800 miles away; Santa Marta, 700 miles away, and its smaller stations throughout Central America and the West Indies. The most modern and powerful equipment in the world for the distance required has been employed.

VESSELS EQUIPPED WITH MARCONI APPARATUS SINCE THE MAY ISSUE

Names	Owners	Call Letters
s. s. Sarnia	The Atlantic Fruit Company	KVR
s. s. Sibiria	The Atlantic Fruit Company	KVS
s. s. Clan Macintyre	Cayzer, Irvine & Company	MOC

ALBERT MEDAL FOR MARCONI

The Royal Society of Arts has presented the Albert Medal to Guglielmo Marconi "for his services in the development and practical application of wireless telegraphy." The medal is awarded annually as a reward for "distinguished merit in promoting arts, manufactures and commerce." It was instituted in 1863.

MARCONI'S TRIBUTE TO EDISON

Guglielmo Marconi was among the well-known men who paid tributes to Thomas A. Edison when a gold medal was presented to the latter by the Civic Federation in Carnegie Hall, New York, on May 6. Mr. Marconi said that the entire world acclaimed Mr. Edison as friend and benefactor.

SERVICE ITEMS

David Sarnoff, assistant traffic manager of the Marconi Wireless Telegraph Company of America, has returned to New York after a trip to New Orleans.

John H. Tingle has resigned from the auditing department of the Marconi Wireless Telegraph Company of America to enter the employ of an exporting house. The members of the stenographic department gave a luncheon in his honor in the resting room in the Woolworth Building on May 7.

G. W. Almour, who represented the Marconi Wireless Telegraph Company of America, at Key West, Fla., is no longer connected with the service.

NEW MARCONI QUARTERS

The Cliff street offices of the Marconi Wireless Telegraph Company of America have been removed to the eighth floor of the building at 57 Duane street, New York. The new quarters include a lounging room for operators.

THE SHARE MARKET

New York, May 26.

The only advances shown in Marconi issues are confined to the dividend-paying English preferred stock. The brokers report that some activity is shown in these securities and attribute it mainly to the difficulty of securing the stock, which is principally held in foreign countries. Italy's declaration of war and the recall of Mr. Marconi making necessary a postponement of the Telefunken patent suits, the trading in American stock is practically at a standstill. A slight fractional decline is revealed in to-day's quotations and, pending the clearing up the situation arising through President Wilson's note to Germany, the tendency in the several Wall Street markets is to let trading drift further into idleness.

Bid and asked quotations to-day:

American, 2⅜-2¾; Canadian, 1-1½; English, common, 9½-14; English, preferred, 8½-12½.

MARCONI AID ASSOCIATION

At a meeting of the employees of the Marconi Wireless Telegraph Company of America, held at the company's New York offices, on May 24, an association was organized to be known as the "Marconi Wireless Aid Association."

The following were elected officers: President, E. T. Edwards; vice-presidents, David Sarnoff, A. H. Ginman, T. M. Stevens and F. H. Mason; secretary, L. MacConnach; treasurer, K. P. Kirk.

The executive committee is composed of G. S. DeSousa, E. B. Pillsbury, G. H. Porter, W. A. Winterbottom, L. Lemon and Miss T. N. Brown.

The objects of the Marconi Wireless Aid Association are similar to those of other aid associations and societies in the telegraph service.

Directors and Officers

MARCONI WIRELESS TELEGRAPH COMPANY
OF AMERICA

WOOLWORTH BUILDING
233 BROADWAY, NEW YORK

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Commendatore G. Marconi
Edward J. Nally
John Bottomley
James Van Vechten Olcott

Godfrey C. Isaacs
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George S. De Sousa
James R. Sheffield
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Edward J. Nally James R. Sheffield
James W. Pyke

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Edward J. Nally....................
Vice-President and General Manager
John Bottomley ....
Vice-President, Secretary and Treasurer

George S. De Sousa....*Assistant Treasurer*
C. B. Smith............*Assistant Treasurer*

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William B. Vansize........*Patent Attorney*
Sheffield & Betts.............*Patent Counsel*
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Harry Shoemaker.......*Research Engineer*
Roy A. Weagant........*Assistant Engineer*
C. D. Warner...........*Assistant Engineer*
Julius Martin ....*Assistant Engineer*

Auditing Department

C. J. Ross ....*Auditor*

Traffic Department

George S. De Sousa.......*Traffic Manager*
David Sarnoff....*Assistant Traffic Manager*

TRANS-OCEANIC DIVISION

C. H. Taylor.... .... *Engineer*
Lynn C. Everett.. ....*Assistant Engineer*
Edw. B. Pillsbury...*General Superintendent*
Lee Lemon ....*Superintendent*
William A. Winterbottom.*Commercial M'g'r*
Harry Chadwick.............*Office Manager*
Paul C. Kast.......................*Cashier*

Manufacturing Department

Aldene, N. J.

G. W. Hayes.....*Superintendent of Factory*

Purchasing Department

G. Harold Porter........*Purchasing Agent*

Publishing Department

J. Andrew White....*Editor of Publications*
Wheeler N. Soper.........*Assistant Editor*

Pacific Coast Division

Merchants Exchange Bldg., San Francisco

A. H. Ginman......*General Superintendent*
John R. Irwin......*Supt. Northern District*
George J. Jessop....*Supt. Southern District*

Eastern Division

Operating Department, 29 Cliff St., New York

Ernest T. Edwards..........*Superintendent*
G. W. Nicholls......*District Superintendent*

Southern Division

American Building, Baltimore, Md.

T. M. Stevens..............*Superintendent*

Gulf Division

917 Decatur St., New Orleans, La.

E. C. Newton...............*Superintendent*

Great Lakes Division

Schofield Bldg., Cleveland, Ohio

F. H. Mason................*Superintendent*

Queries Answered

Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of an individual can be answered. To receive attention these rules must be rigidly observed.

Positively no Questions Answered by Mail

S. H., New York City, asks:

Ques.—(1) I have a problem which I wish you could solve for me. My aerial has a single wire, having a natural wave-length of a little less than 300 meters. I hear amateur stations on their 200-meter wave-lengths best with about one-half of the wire of the primary winding in use. When I connect a Murdock $5 variable condenser in series with the aerial I cannot hear amateurs. I have not a wave-meter so I do not know when my aerial is adjusted to a wave-length of 200 meters, but I am, of course, sure that many amateurs in my vicinity do not emit a pure wave. I wish you could explain why I require so much wire on the primary winding with my circuits apparently out of resonance for the best signals. The amount of wire I use for amateur wave-lengths is the same that I employ in getting the weather reports from the Brooklyn Navy Yard.

Ans.—(1) We might answer this query at once by the statement that your receiving tuner is improperly designed. Lacking data concerning its construction and over-all dimensions, however, we are puzzled to give an explanation of your trouble. Are you sure that the antenna has a wave-length of 300 meters? Perhaps its natural wave-length is less than you suppose, and therefore you require the amount of inductance stated to adjust to the amateur wave-length. Again, it may be that the secondary winding of your receiving tuner does not have a sufficiently small value of turns in use at the lowest wave-length adjustment to get that circuit in resonance with amateur wave-lengths. On this account oscillations must be forced into the detector circuit which, of course, can only be done by the use of a considerable amount of inductance in the primary winding. That you hear the Brooklyn Navy Yard on the same wave-length adjustment at which you hear amateur stations may be accounted for by the fact that you probably employ a very close coupling between the primary and secondary windings and therefore receive signals, due to forced oscillations, from other wave-lengths. If your receiving tuner is properly designed and the wave-length of your aerial is as you state about 300 meters, the addition of the condenser in series should result in an increase of signals from amateur stations. These phenomena are undoubtedly due to the ill design of the receiving tuner.

* * *

P. W. D., Anglesea, N. J., asks:

Ques.—(1) Does a condenser in series with the aerial when transmitting cut down the emitted wave-length?

Ans.—(1) Yes; by a certain amount, depending upon the capacity of the condenser.

Ques.—(2) What is the longest wave-length I can adjust to with a receiving tuner designed as follows: A primary 3¼ inches in diameter by 7 inches in length, wound closely with No. 24 enamel wire; the secondary winding is 3½ inches in diameter by 7 inches in length, wound with No. 50 D. S. C. wire. This receiving tuner is connected with the aerial, comprising six wires 135 feet in length by 40 feet in height.

Ans.—(2) If the secondary winding of the receiving tuner is actually wound with No. 50 D. S. C. wire you should be able to adjust to wave-lengths of between 6,000 and 7,000 meters. The natural wave-length of your aerial is about 320 meters, and it will be increased to 3,000 or 4,000 meters by the addition of the primary inductance in series.

* * *

T. A. B., New Orleans, writes:

Ques.—My aerial consists of six strands of No. 14 aluminum wire, 48 feet in length. It is 64 feet from the ground on one end and 20 feet from the earth on the other; in fact, it is almost perpendicular. This aerial is just in course of erection and I should like to know if its position would interfere with operating. If not, what is the wave-length and the receiving distance?

Ans.—The approximate wave-length of your aerial is 170 meters. This disposition of the aerial should not interfere with efficient working and we see no reason why you should not obtain results. Of course, you cannot expect to receive at extremely long distances with this aerial, but you should be able to hear ship and shore stations within a reasonable distance from your city.

* * *

O. E. C., Pawtucket, R. I.:

A fan motor designed for operation on 125 cycles is bound to heat up when connected to a 60-cycle source of energy because of the fact that the winding has not sufficient impedance for the lower frequency. We are

unable to account for the sudden stopping of this motor and then starting at a later period, except that there may be a loose connection in the field coil windings which shakes loose after the motor is in operation.

* * *

F. P. G., Charleston, S. C., asks:

Ques.—(1) I have all the standard works on the theory of wireless telegraphy, but I want a book or pamphlet which will give me such practical details as the number of words to count in getting the check of a message, how figures and punctuation marks are counted, etc. Where can I purchase such a book? I also wish to know whether the operator's personal "sign" is to be included in the check.

Ans.—(1) Outside of the service of the Marconi Company there is no book available containing the information you want, that is to say, applying particularly to the handling of wireless telegraphic traffic. The cable method of counting and checking words is used in the radio service. If you will secure a copy of the Western Union or Postal tariff books you can obtain full information on this subject. The Marconi traffic (tariff) book is not available to those outside of the service. You might communicate with the Department of Commerce or the radio inspector in your district and secure a copy of the London International Radio Telegraphic Convention, and also the United States Regulations pertaining to the transmission of radio telegraphic traffic. A book covering this phase of the situation will be issued under the auspices of THE WIRELESS AGE. Referring to the latter portion of your query, the operator's personal sign is not included in the check of the message, nor in any portion of the message.

Ques.—(2) I heard the government inspector ask this question: "How would you test your antenna insulation to see if it is perfect?" What is the correct answer?

Ans.—(2) The insulation of an aerial is most satisfactorily tested by connecting a spark gap directly in series with it, the terminals of the spark gap being in turn connected to a high potential transformer or induction coil. If the aerial insulation is bad no spark discharge will occur at the gap even when it is shortened to say 1/8 inch.

Ques.—(3) I have often heard NAO (Charleston, S. C.) use this character:

. ——— ——— ——— ——— ———

What does it mean? Is it a mistake for the numeral 1.

Ans.—(3) This is not a distinct character and is probably an error in making the numeral 1.

Ques.—(4) I sometimes hear a signal which sounds like AHR at the beginning or ending of a message. What does this mean?

Ans.—(4) This is an abbreviation often used on the American Morse lines and means "another"; that is to say, the sending operator has still another message to dispatch.

Ques.—(5) Why is it that a variable condenser in shunt or connected across the primary of a receiving transformer has absolutely no effect on the signals, but again will entirely cut out others, notably, NAN and NAR, unless properly adjusted? Is it because these stations are more sharply tuned than others?

Ans.—(5) This is a subject that has not been as thoroughly investigated as some others, but without going into the details of a complete explanation we can inform you that the open oscillatory circuit of your receiving set has a certain effective capacity and a certain effective inductance. When a condenser is connected in shunt to the primary winding you have a second oscillatory circuit which at certain adjustments will not change the wave-length of the antenna system. Suppose, for example, that the antenna system were adjusted to a wave-length of 1,000 meters with a certain amount of inductance connected in series with the primary winding. If, then, a condenser is connected across the primary winding so that the circuit comprising the coil of wire and the condenser has a wave-length of 1,000 meters you, in reality, have two 1,000-meter circuits in parallel. A little closer examination will reveal that by so doing you have in some instances doubled the capacity of the antenna system and halved the inductance value; therefore you have not changed the wave-length at all. In other words, if you connect two oscillatory circuits of identical wave-length in parallel the system as a whole will vibrate at the same wave-length as each of the individual circuits. This is probably the condition that obtains when the addition of capacity at the condenser has no effect on the received signals. There are so many factors entering into the case we could not give a specific answer unless we had actual and detailed data (numerical values) of all the equipment.

* * *

E. T. M., Chicago, Ill.:

It is totally impossible to calculate the wave-length of an aerial having the design shown in the sketch accompanying your communication. We should say that the wave-length of this aerial is about 250 meters although we are not certain. It is highly desirable that you secure a wave-meter to place this apparatus in resonance at the wave-lengths you desire, namely 200 meters and 425 meters. Apparently the wave-length of this aerial is not too long to be reduced to 200 meters by means of a series condenser. You should construct a short wave condenser of four plates connected in series, each plate having dimensions of 10 x 10 inches, covered with tin foil 8 x 8 inches. This condenser will probably reduce the wave-length of the aerial below 200 meters, but it can be raised to that value by the addition of a small amount of inductance. We do not understand the description of your sending condenser. In fact, it is not at all clear and, therefore, we cannot give advice as to its probable capacity.

You say that you believe the capacity value is .019 microfarads. This is too large for work on 200 meters, but is about correct fo

425-meter work. A condenser for use at a wave-length of 200 meters should not have a capacity greater than .01 microfarads. The secondary winding of the oscillation transformer, as described by you, has insufficient turns to raise the wave-length of this aerial to 425 meters. We advise you to construct an aerial tuning inductance to be connected in series with the aerial. You will obtain far better results by exciting this antenna with a small induction coil, measuring the wave-length with a wave-meter. Then you should add sufficient turns in the antenna circuit until you attain first a wave-length of 200 meters and next a wave-length of 425 meters. Perhaps the radio inspector in your district will call at your station and adjust it to a definite wave-length. We believe, however, that you are within the zone of commercial interference and will not be allowed to work your station at a wave-length of 425 meters.

* * *

K. H., Marion, Ohio:

It is a fact, as the article in the March issue of THE WIRELESS AGE says, that in order to receive the signals from the war ships of the British Admiralty close tuning is necessary. The Admiralty ships which you hear in Ohio are not operating on long wave-lengths nor is the emitted wave particularly sharp; but the ships of the Admiralty in the Mediterranean Sea and in the North Sea use very long wave-lengths for official communications and must be carefully attuned to in order to be received. Your receiving set is doing nothing out of the ordinary, because the signals from the Admiralty ships lying off Sandy Hook, N. J., are heard by all the amateurs within a radius of 1,000 to 1,400 miles.

We do not know the two strange stations you hear or where they are located. There are very few trans-Atlantic liners of the larger types, such as the Mauretania, at present engaged in trans-Atlantic service; therefore, you do not hear the signals.

Ans.—(3) You say that when you move the slider of the primary a click is heard in the head telephones; this is a sure indication that there is a loose connection between the primary winding and the slider; that is to say, the slider does not make a good contact and when the circuit is opened and then closed you hear a click due to the accumulation of static charges which discharge through the receiver windings.

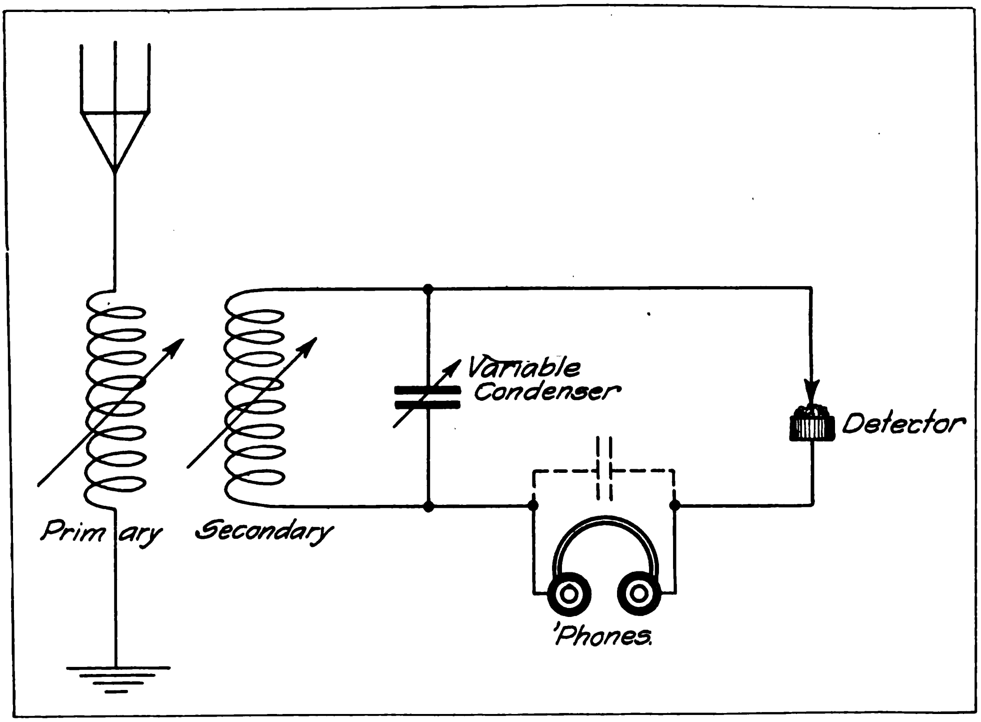
Ans.—(4) The vessels engaged in the trans-Atlantic service are fitted with 1½ k.w. sets supplied by the International Mercantile Marine Communication Company, Ltd., of London, England.

* * *

W. H. W., Anniston, Ala.:

The receiving set you describe in connection with the antenna of the dimensions given should afford a night range of 500 miles, but the daylight range is rather doubtful; it may possibly be 150 miles.

In the accompanying sketch we give a complete circuit diagram for your apparatus. Your description included no fixed condenser, which should be placed in shunt to the head telephones, as shown by the dotted line in the drawing.



R. F., Davenport, Iowa, writes:

Ques.—(1) Please tell me how a 2-inch wireless coil drawing 6 amperes can be operated on a 30-volt storage battery without being injured?

Ans.—(1) You should connect a resistance coil in series with the battery to cut down the current consumption. Why not connect the storage cells in parallel, that is to say, make a series parallel connection so that the resultant voltage will be suitable to the coil in question?

Ques.—(2) Will the spark produced by the coil be of sufficient volume to employ a rotary gap?

Ans.—(2) No. The use of a rotary gap in connection with a spark coil has never been satisfactory.

Reply to third query: The night range of your apparatus is about 1,500 miles during the winter months.

* * *

L. F., Fort Stanton, N. M.:

The "Text Book on Wireless Telegraphy," by Rupert Stanley, will fill your needs regarding the modern systems of wireless telegraphy. There are several books in the market for the more advanced students of wireless telegraphy. We suggest that you get in touch with the Book Department of THE WIRELESS AGE, 450 Fourth Avenue, New York City.

* * *

H. S., Albany, N. Y., writes:

Ques.—(1) When employing a rotary spark gap in connection with a ¼ k.w. set should the condenser capacity be greater or smaller than when using a stationary gap?

Ans.—(1) The condenser capacity should be of smaller value when employing the rotary gap.

Ques.—(2) With a 350-meter aerial and a receiving tuner capable of tuning to 1,800 meters, what should be the size of the wire and the dimensions of the tubes of the loading coil to efficiently receive Glace Bay? Should the secondary be loaded, too?

Ans.—(2) It requires an extremely sensitive receiving detector to hear Glace Bay inland (in the States), and we are in doubt whether you would be able to receive these signals. A loading coil 25 inches in length by 5½ inches in diameter, wound with No. 20 S.S.C. wire, will raise the wave-length of the antenna circuit to about 8,000 meters. A loading coil in the secondary circuit, 15 inches in length, 5½ inches diameter, wound closely with No. 26 wire, should raise the wave-length of the secondary circuit to about the same value.

Ques.—(3) Kindly tell me the difference between a 40 and a 60-cycle transformer.

Ans.—(3) For a given number of watts the 40-cycle transformer will have a greater value of impedance than the 60 cycle transformer (in the primary circuit); that is to say, there will be more turns of wire or a larger iron core than in the case of the transformer having a higher frequency.

* * *

E. S. L., Kenosha, Wis.:

The vacuum valve detector, properly connected up, should give better signals than the silicon detector. Make sure that your connections are proper for the vacuum valve. The positive pole of the high voltage battery should be connected to the plate and the negative end of the high voltage battery connected to the positive end of the filament battery. Again, the secondary winding of your receiving tuner should be so constructed that for the wave-length desired inductance predominates in the secondary winding and the capacity in shunt is at a minimum value. Perhaps you have insufficient potential in the high voltage battery to bring the vacuum valve to a sensitive condition. If there is any doubt in this respect try adding additional cells in the circuit. If it requires an abnormal value of voltage to secure the blue glow in the bulb, apply an alcohol torch to one side of the bulb until the blue glow appears at a much lower potential. The January, 1914, issue of THE WIRELESS AGE contains definite instructions for the operation of the vacuum valve.

* * *

R. D. M., New Orleans, La.:

Ans.—(1) A receiving tuner, the normal wave-length range of which is 1,000 meters, is too small to be boosted in either the primary or secondary windings to a wave-length of 5,000 or 6,000 meters. For the longer wave-lengths it is best to design a special receiving tuner having sufficient values in both the primary and secondary windings to attain this wave-length. Data for the construction of tuning coils of definite wave-length were published in the series on "How to Conduct a Radio Club," in previous issues of THE WIRELESS AGE.

The January, 1914, issue of THE WIRELESS AGE contained a complete article on the adjustment of the vacuum value.

Ans.—(3) A potentiometer for use with a carborundum crystal should have a resistance value of between 300 to 400 ohms. Generally one cell of battery is sufficient in connection with this potentiometer.

Ans.—(4) The fixed stopping condenser for use with the carborundum detector should have a capacity of .003 mfd.; although it may vary from .0015 to .004. Twelve interleaved sheets of tin foil 3 x 4 inches, separated by thin paraffin paper and closely pressed together, will give the desired capacity.

Ans.—(5) A small potential will increase the sensitiveness of the galena, silicon and perikon detectors. This is not believed by the amateur field at large, but is nevertheless a fact. If the potentiometer has a resistance of 300 to 400 ohms, a fixed resistance of 2,000 ohms connected in series will reduce the potential of a single cell of battery to such value that it may be conveniently employed in connection with the detectors named.

* * *

A. C. C., Lewiston, Mont., writes:

In the Electrical World of March 13th, Dr. A. H. Taylor gave a description of a double vacuum valve type of receiver for continuous waves. Would his arrangement of connec-

tions be as efficient for amplifying spark stations (providing the two stopping condensers were cut out) as the conections shown in the January, 1914, issue of THE WIRELESS AGE?

Ans.—(1) The arrangement described by Dr. Taylor is equally applicable to the reception of damped or undamped oscillations. The circuit may be used either with or without the fixed condensers. If a fixed condenser is employed in connection with the secondary winding of the receiving tuner its capacity should not be more than .00005 microfarads. With the condenser in series, the secondary winding must have more turns of wire than when it is not used. It is suggested that you employ a variable condenser at this point, say for instance a small Blitzen condenser, having a maximum capacity of .0008 microfarads and a minimum capacity of .00001 microfarads. The fixed condenser connected in series with the auto-transformer to the second vacuum valve is preferably of variable capacity and should have a value of about .001 microfarads, depending to some extent upon the constants of the auto transformer. With the exception of the fixed condenser described in the article referred to, the diagram of connections is a replica of the connections shown in the January, 1914, issue of THE WIRELESS AGE. The method as described by Dr. Taylor for the reception of damped and undamped oscillations is not particularly efficient because of the fact that the filaments must be burned to such an extremely high degree of incandescence. There are circuits in use for amplifying the signals from the single vacuum valve bulb that require a very low degree of incandescence at the filament and give extremely sensitive results. As a matter of fact, it has been found possible, with a 60-foot aerial, to read signals from Honolulu in New York City. In the arrangement of circuits described by Dr. Taylor the local telephone circuits of the audion do not generate pure undamped oscillations, but we really believe upon investigation will be found to be traversed by a series of interrupted direct currents taking place at a very high rate per second of time. Also the circuits shown allow of no control of the local energy and thus, whether or not the detector will be responsive to undamped oscillations, is a "hit or miss" proposition. The foregoing statements will cover your queries second and third.

* * *

L. P. L., Rochester, N. Y.:

Inasmuch as you have done everything possible to maintain your vacuum valve in a sensitive condition we cannot give advice why such a falling off in signals has been obtained. We suggest that you carefully inspect all connections, noting particularly whether one or two of the cells in the high voltage circuit have not become "dead." This is an error that has recently been discovered in many vacuum valve circuits, namely, one or two of the individual cells in each flash light unit have become exhausted and have seriously hindered the passage of current through the telephone circuit. As you have made a number of tests to determine the trouble, we have no additional advice to give. There is no reason why results should not be obtained from the vacuum valve amplifier described in the January, 1914, issue. If amplifications are not received there is something wrong with the connections employed.

* * *

F. O., Berkeley, Cal., writes:

Ques.—(1) What is the voltage of a transformer of 1 k.w. capacity which is wound through 110 volts, 60 cycles, which will jump (arc) ¼ inch between needle points when cold, but will jump over 9/16 of an inch in air when the points are red hot, the maximum input being used in both cases.

Ans.—(1) This corresponds to a voltage of about 8,500.

Ques.—(2) How many plates of glass, 8 x 10 x ⅛ inches in thickness with tin foil 6 x 7 inches on both sides, assembled and mounted as per sketch, should be used with the transformer referred to in order to get the maximum capacity with 200 meters' wave-length, allowing 2 feet of wire for connections and two turns of No. 4 copper wire, 1 foot in diameter and spaced one inch in the primary winding of the oscillation transformer?

Ans.—(2) The condenser should have a capacity of .008 microfarads. Thirteen of these plates connected in parallel will give the desired capacity.

Ques.—(3) I have an induction motor for 110 volts, 60 cycles, giving 1,800 revolutions per minute. I should like to know the diameter of the wheel, the number of plugs, and the radius from the shaft to the line of plugs thereon for a synchronous rotary gap running at certain speed.

Ans.—(3) It will be rather difficult to keep the motor in exact synchronism with the alternating current charging the condensers. For a synchronous spark discharge you require only four electrodes on the revolving disc. The disc should be about 6 inches in diameter with electrodes placed at a distance of 2½ inches from the center. The electrodes should be 3/16 of an inch in diameter.

If you desire a spark gap of the non-synchronous type the disc may be 8 inches in diameter and fitted with 12 points equally spaced about the circumference and at a distance of 3 inches from the center. These electrodes also should not be more than 3/16 of an inch in diameter and should revolve very closely to the stationary electrodes.

Ques.—(4) Would this gap give as much or more radiation as the high tone gap described in the August, 1914, issue of THE WIRELESS AGE?

Ans.—(4) It is likely that it will give increased radiation because of the increased size of the electrodes.

Ques.—(5) Please tell me how many turns of No. 8 copper wire, 10 inches in diameter, spaced ¾ inch apart, I can use with an aerial of four wires spaced 4 feet, 8 inches; 40 feet long x 50 feet in height at one end and 20 feet at the other end, with a lead-in of 15 feet at

the lower end, and a ground wire of 25 feet in length, to keep within a wave-length adjustment of 200 meters?

Ans.—(5) Eighteen turns of the size wire you suggest will raise the wave-length of the circuit to about 200 meters.

* * *

F. J. R., Auburndale, Mass., writes:

Ques.—(1) What does "one" signify when it follows the call of the sending station?

Ans.—(1) There has been some misinterpretation of this signal. You probably mistake it for the signal "AR," which is the termination signal for a radiogram, according to the International Telegraphic Convention.

Ques.—(2) Is the diagram of a ship station published in the October, 1913, WIRELESS AGE, which is required for the first grade commercial license issued by the United States government?

Ans.—(2) Use may be made of this diagram, but it is not necessarily the one that must be drawn to comply with the examination. The authorities who hold the examination are more interested in the fundamental circuits of a wireless telegraph set, although at times it is necessary to insert the details of commercial apparatus.

Ques.—(3) What is the wave-length of an aerial, T type, 40 feet high by 90 feet in length, with a 30-foot lead-in? It consists of three wires.

Ans.—(3) The wave-length of this aerial is about 210 meters.

Ques.—(4) What are the calls and the power of the amateurs holding special licenses in district No. 1?

Ans.—(4) The following stations are listed as having special licenses:

Location.	Call Letters.	Wave-Length.	Owner.
Amesbury, Mass.	IXA	300, 600	Wireless Specialty Apparatus Co.
Boston, Mass.	IXB	300, 600	Wireless Specialty Apparatus Co.
Boston, Mass.	IXH	300, 400, 600	Holtzer-Cabot Electric Co.
Cambridge, Mass.	IXP	300, 550, 600	George W. Pierce.
Cambridge, Mass.	IYH	300, 550, 600	Harvard Univ.
Chelsea, Mass.	IXT	300, 600, 700	William J. Murdock Co.
Gloucester, Mass.	IXI		John Hays Hammond, Jr.
New Bedford, Mass.	IVO	200, 300	Lester I. Jenkins.
Pittsfield, Mass.	IXG	600	Gen. Elec. Co.
Watchaug Pond, R. I.	IXW		Ralph C. Watrous.

Ques.—(5) What is the address of the Radio Relay League?

Ans.—(5) Address your communications care of Clarence W. Tuska, Secretary, Hartford, Conn.

* * *

W. A. C., New Orleans, La., writes:

Ques.—(1) Please let me know if I can receive signals from the Arlington station with the following apparatus:

A 2-wire aerial, 125 feet in length, the wires spaced 6 feet apart and placed 60 feet above the ground; a commercial loose coupler; tuning coil 12 inches in length; two .01 microfarad fixed condensers, silicon and galena detectors and 2,000 ohm head telephone set. If not, please let me know what is required.

Ans.—(1) You have not given us the dimensions of the loose coupler and therefore we cannot make a definite reply; but with one of the condensers as described in shunt with the secondary winding of the receiving tuner and the loading coil in series, you should have but little difficulty in receiving the signals from Arlington, provided the loose coupler has the dimensions to be expected in the average amateur set.

Ques.—(2) What is the wave-length of this aerial?

Ans.—(2) About 325 meters.

Ques.—(3) To hear Arlington's signals, should my aerial be directed toward that station?

Ans.—(3) It is possible if you employ a flat top aerial, that a certain definite direction may give the best results, but it is more or less problematical. The directional effect of aerials are not violent except where the flat top portion of an aerial is considerably longer than the vertical portion. With the aerial you describe we are inclined to believe that it will make little difference in which direction it is swung.

* * *

J. G. S., Frankfort, Mich., inquires:

Ques.—(1) Can previous issues of THE WIRELESS AGE, such as the January, 1914, issue, be purchased from your company, and at what price?

Ans.—(1) Back numbers of all issues except the June, 1914, issue, can be purchased at the regular price.

Ques.—(2) Please give the dimensions and data for the construction of a 1/8 k.w. open core transformer to be operated on 60 cycles, 110 volts, alternating current.

Ans.—(2) The following data are for a transformer of the closed core type, having a square frame: length of the core, 9 inches; width of the core (outside measurement), 6½ inches; thickness of the core, 1½ inches; number of layers in the primary winding, 16; width of the secondary section, 5 inches; thickness of the insulation between the core and primary, 3/16 of an inch.

The primary winding is separated from the secondary winding by empire cloth. The primary is wound with 3½ pounds of No. 16 D. C. C. wire, while the secondary is wound with 8 pounds of No. 34 enameled wire. The secondary should consist of seven sections, 1/4 of an inch in thickness and 2½ inches in width. The insulation between the secondary winding and the iron core should consist of empire cloth 1/4 of an inch in thickness. We

have no data for an open core transformer of this capacity.

Ques.—(3) What detectors are suitable for 3200-ohm telephone receivers?

Ans.—(3) Any detector of the crystalline type is suitable for telephones of this value of resistance.

Ques.—(4) Does a quenched gap improve the tone of the spark from the spark coil?

Ans.—(4) No.

Ques.—(5) Is it practical to use a rotary spark gap on a spark coil?

Ans.—(5) No.

* * *

B. E., Shilosh, N. J., asks:

Ques.—(1) What is the inductance of a spirally wound aerial 14 inches in diameter, the wires being spaced 1 inch apart and the coil 20 feet in length, as per the enclosed diagram?

Ans.—(1) Do you wish to know the effective inductance of this coil when it is used as an element of an oscillatory circuit, or do you desire to know the low frequency inductance of the coil alone? Is the coil grounded on one end? The inductance of the helix itself is 2.93 microhenries.

Ques.—(2) Is there any sure method of preventing the lights flickering when a 1 k.w. transformer is used? The electric light company will not allow me to install a transformer unless I will guarantee that the lights will not flicker.

Ans.—(2) You will encounter the least trouble in this respect if you use a closed core transformer fitted with a magnetic leakage gap having a high power factor. Sometimes these effects are at a minimum when connection is made directly to the city mains through a separate meter. If your transformer has a poor power factor there is nothing that we can suggest to help you. Try to obtain permission from the electric light company to make a trial and if flickering of the lights is experienced it may be reduced to some extent by variation of the condenser capacity in the closed circuit or by the insertion of a reactance coil in series with the primary winding. Inasmuch as we have no data concerning your set we cannot give further advice.

Ques.—(3) How many No. 14 B. & S. copper wires bunched together would be equivalent to a No. 4 solid copper wire, as required by the underwriters?

Ans.—(3) Five No. 4 wires connected in parallel will afford the same current carrying capacity.

Ques.—(4) Does THE WIRELESS AGE answer more than one set of questions from the same person?

Ans.—(4) Yes, if the questions have value and are of interest to our readers in general.

The description of the phenomena in your last query is too lengthy for reproduction, but we are inclined to believe that the odd station which you hear at five o'clock in the afternoon is the Goldschmitt high-frequency alternator station at Tuckerton, N. J. While it is not possible to receive undamped oscillations on the ordinary receiving apparatus, it has been the experience of the Editor of this Department that the signals from the Tuckerton station may be read on an ordinary crystal detector up to a distance of about 70 miles. It is likely that this is due to the immense amount of energy radiated by this station.

* * *

E. G. R. inquires:

Ques.—(1) In building an aerial for long distance work please tell me which would be the better for general use: a 2-wire aerial 250 feet in length and 55 feet in height at one end and 45 feet at the other, or the same amount of wire stretched out in one piece, making it a single wire aerial 500 feet in length, the height remaining the same.

Ans.—(1) For stations such as Sayville and Arlington and the government station at Key West, Fla., we prefer the single wire aerial 500 feet in length. For reception from amateur stations the two strand aerial, 250 feet in length, is preferable.

Ques.—(2) With the following instruments and aerial, please tell me what size loading coil and size of wire I would have to make to be able to hear the high power station at New Brunswick, N. J. The loose coupler primary is wound with No. 22 enameled wire on a tube 3½ inches in diameter and 4½ inches in length; the secondary winding consists of No. 28 silk covered wire made on a tube 3 inches in diameter and 4 inches in length; it is to be used in conjunction with the 250-foot aerial just described. The detectors to be employed will be of the crystalline type.

Ans.—(2) You will require a loading coil 30 inches in length, made on a tube 5 inches in diameter, wound full of No. 20 S. S. C. wire. In the secondary circuit, you will require a loading coil 20 inches in length, wound closely with No. 30 wire, the tube being 5 inches in diameter.

Please note that the New Brunswick station is not in operation.

* * *

G. W. F., Rochester, N. Y.:

We have carefully considered your query and enclosed diagram and advise as follows:

Either one or both of the aerials, as you suggest, are too short for the satisfactory reception of signals from high power stations. If you wish to comply with the amateur law concerning transmitting, either of the aerials may be employed for the purpose, but on the other hand if you expect to receive signals from the high power stations of the United States you should erect, if possible, an antenna having a linear length of no less than 1,000 feet. Since you seem to be limited in this respect it is difficult to give further advice. It is also a problem to calculate the wave-length of an antenna of the type you suggest.

The wave-length of an antenna is generally measured with a wave-meter. Past issues of THE WIRELESS AGE have contained complete instructions for this measurement. A 10-foot

spreader is quite sufficient for an 8-wire aerial.

* * *

M. B. R. asks:

Ques.—(1) Will you please inform me what stations BBH and BEH are?

Ans.—(1) BEH is the steamship Argonaut; BBH is the steamship Implacable.

Ques.—(2) How many turns of No. 18 D. S. C. wire (B. & S. gauge) should be wound on a frame 5 inches square, to give a maximum wave-length of 800 meters when used in connection with a .005 microfarad variable condensers? What should be its minimum wave-length?

Ans.—(2) Ten and one-half turns of No. 18 wire with two leads, each 12 inches in length, extended to the variable condenser, will give the circuit a period of 800 meters. The minimum wave-length of the circuit, that is to say, the minimum wave-length at which the wave-meter can be practically worked, is about 120 meters.

* * *

L. T. S., Worcester, Mass.:

Ans.—(1) It is impossible to give the wave-length of a tuning coil alone, except the natural period of the coil which, of course, can be readily measured; but to give data for the construction of a coil which will tune to 5,000 meters is out of the question unless the calculator knows the size of the antenna (the inductance of capacity value) with which the coil is to be used.

Ans.—(2) With an aerial 170 feet in length and ordinary receiving apparatus, such as you describe, you will not be able to hear stations across the ocean. This work can only be done with the vacuum valve detectors and special associated circuits which, for the present, cannot be published.

Ques.—(3) Please tell me what size rotary spark gap disc, and the number of points I must use in connection with a 1/8 h.p. motor turning 4,300 revolutions per minute? This set is to be used with a 20,000 volt, 1 k.w. Thordarson transformer on 110-volt, 60-cycle alternating current.

Ans.—(3) The disc should have a diameter of about 8 inches and be fitted with 8 spark discharge points (no more). The disc may be constructed of bakelite, micalite or any of the insulating substances which can be purchased to-day on the open market.

Ans.—(4) You should obtain a license for a 200-meter amateur station; inasmuch as you are located a considerable distance from a naval station, you will be allowed to use nearly the full output of your transformer. Your aerial is somewhat too long to be reduced to a wave-length of 200 meters. Full data on the size of an aerial to meet the government restrictions have been published in the Queries Answered Department in previous issues of THE WIRELESS AGE. There is no advantage as far as distance is concerned in using an inductively-coupled oscillation transformer over the plain helix type.

* * *

F. L. B., Los Angeles, Cal.:

Ques.—(1) Please give me the wave-length and the receiving range of an aerial consisting of two strands of No. 14 copper wire, each 100 feet long, base 7 feet. The height of the aerial is 35 feet at one end, and 15 feet at the lowest end. The aerial is surrounded by trees and the lead-in is 50 feet in length, passing directly over a tin roof. The aerial slopes entirely down hill. The receiving set consists of a loose coupler, a fixed condenser, galena and silicon detectors, and a 75 ohm telephone receiver. About what wave-length can I tune to with this aerial and loose couplers of the following dimensions: The primary is 4½ inches in length by 4 inches diameter, wound with No. 20 copper wire. The secondary winding is 3¾ inches in length by 3½ inches diameter and has a 7-point switch.

Ans.—(1) The natural wave-length of this aerial is about 245 meters. The primary winding, as described, will raise the wave-length to about 700 meters. We can give no definite advice as to the wave-length of the secondary circuit of your tuner because you have not furnished us with the size of the wire employed. The secondary winding should be made of No. 30 or 32 S. S. C. wire. The primary of the receiving tuner should be wound with No. 26. With wire of this size you can reach a wave-length adjustment of about 2,300 meters. If you wish to attain a wave-length adjustment of 3,000 meters so as to be able to hear the Arlington time signals or other long wave-length stations, the primary winding should be 5 inches in length, wound closely with No. 26 wire. Better results will be obtained by the use of telephone receivers having a high value of resistance; say 2,000 ohms.

* * *

H. T. C., Atlantic City, N. J., writes:

Ques.—(1) My antenna is located on the roof of a hotel. I have trouble in receiving, because of the noise of a 110-volt D. C., 300 ampere, 50 h.p. generator. When the main switch is pulled I do not hear the noise. Is there any way of overcoming this?

Ans.—(1) You have a difficult problem on your hands. There is only one genuine cure for this trouble: If the D. C. leads from this generator were enclosed in iron conduit and the conduit properly connected to earth the effect would be at a minimum. You might try putting two 1 microfarad condensers in series across the D. C. line, grounding one terminal of the telephone receiver through a very small condenser to earth.

* * *

S. M., Portland, Ore., writes:

Ques.—(1) Please tell me which of the following is best suited to raise the spreader of an aerial, from the standpoint of durabilty and efficiency: ¼-inch braided cotton rope, ¼-inch twisted cotton rope, ¼-inch sash cord, 3/16-inch galvanized iron cable, ½-inch twisted manila rope?

Ans.—(1) We should prefer, for general durabilty, 3/16-inch galvanized iron cord which, of course, must be carefully insulated from the wires in the antenna. There is a class of

rope used for this purpose which is known as Russian boat rope and is very durable.

Ques.—(2) Can you give some formula for paint or any compound to be used on the wire, insulators and rope, for the purpose of keeping spiders off? They build their webs and cocoons on everything, causing the antenna rope and insulation to leak in time of dampness.

Ans.—(2) We suggest that you employ glazed porcelain or electrose insulators in your antenna system, which we believe will be proof from the spiders. We fail to see how spiders could injure galvanized iron rope. You might try covering the spreaders with black asphaltum paint, which possesses insulating properties and may prevent the destruction of the wood. There is no reason why you cannot employ metallic spreaders made of iron gas pipe. The spreaders are, in turn, insulated from the halyards by hard rubber insulators or glazed porcelain insulators connected in series.

Ques.—(3) Please tell me which antenna is preferable: A four wire aerial, 2½ feet apart, 63 feet in length by 48 feet in height, or a six wire aerial 1½ feet apart, same length and same height?

Ans.—(3) There is very little difference. The last-named aerial will have a lower value of resistance giving better conductivity. The increase in wave-length will be very slight and not sufficient to warrant the expense of the additional wire.

Ques.—(4) Would a 1½-inch iron pipe, 20 feet in length, buried in moist soil 1½ feet in depth be all right for a lightning ground?

Ans.—(4) If it is proposed to lay this iron pipe lengthwise in the earth it could hardly be said to be an efficient earth connection for lightning. If, however, the gas pipe were driven legthwise to a depth of 20 feet in the earth it would be considered efficient for the conduction of lightning discharges. Zinc or copper plate are often used for this purpose and should have about 150 square feet of surface buried to some depth below the earth to insure the plate being in moist ground throughout the season.

Ques.—(5) A says a brass or copper ribbon ½ inch in width and 1/32 inch in thickness is correct for a ground wire (not lightning ground) and for connecting the sending and receiving apparatus, because high frequency currents travel on the surface of a conductor. B says there would be so much loss of energy at the sharp edges that ribbon should not be used. Which is correct?

Ans.—(5) A more specific case must be cited for comparison. The losses from the sharp edges of the copper wire will be pracically nothing, and we might advise farther that it is not necessary to use copper or brass strips for connecting the circuits of a radio transmitter. Stranded wire will serve the purpose very well and the brush discharge will be less than with copper strip. The brush discharge from copper strip is only serious when very high voltages are employed. The connections in the closed oscilatory circuit of the average amateur set should be made with No. 4 or No. 6 standard copper wire.

* * *

S. T. Gilman, Illinois, writes:

Ques.—(1) Can two ordinary ½ k.w. transformers be connected up in some way to be used as a 1 k.w. transformer? If so, please give instructions.

Ans.—(1) There is no reason why they cannot be connected in this manner, and they are often so employed at commercial stations. If the secondary voltages of the two transformers are identical they may be connected in parallel; otherwise they should be connected in series. It might be advisable to connect the two primary windings in parallel and the two secondary windings in series, the secondary connections being shifted until it is certain that the electro-motive forces in the two transformers are not opposing each other. It is desirable for amateur work that the secondary voltage of the transformer be rather high, somewhere in the vicinity of 15,000 or 18,000 volts, and if the two transformers described have the secondary voltage of the average amateur transformer, namely, about 8,000 volts, the series connection affords a satisfactory method of obtaining high voltages.

Ques.—(2) What is the natural wave-length of an aerial consisting of four wires 45 feet in length, 45 feet in height at one end and 70 feet at the other?

Ans.—(2) The wave-length of this aerial is about 175 meters.

Ans.—(3) The loading coil, as described, will raise the wave-length of your aerial to about 1500 meters.

* * *

G. C., Moscow, Idaho, writes:

Ques.—(1) Would it be advisable to make a loose coupler out of an old tuner with a winding space of 10 inches, the tube being 5½ inches in diameter? With what size of wire should the secondary be wound? What should be the length and diameter of the secondary winding? What would be the wave-length of a coupler of this size?

Ans.—(1) You are evidently not familiar with the principles of receiving apparatus and we should have to know from what stations you expect to receive, before giving you a design for a receiving tuner. This is a matter that should be decided before entering into the construction of a receiving tuner; furthermore, the builder should be guided by the power and wave-lengths of the stations in his vicinity. It is entirely feasible to make a loose coupler with a size of tube as you suggest, but it is difficult to give advice as to how many turns of wire should be used unless we know the dimensions of the aerial with which it is to be employed. We suggest that you read the February, 1915 issue of THE WIRELESS AGE, which contains full instructions for the building of tuning coils of definite wave lengths.

* * *

G. M. C. G., San Francisco, Cal., writes:

Ques.—(1) What is the most efficient density in line per square inch for a silicon steel core of a transformer to be operated on 500 cycles?

Ans.—(1) 15,000 lines per square inch.

Ques.—(2) What is the highest allowable flux density per pole for the poles of a 500-cycle generator? The poles are made of silicon steel laminated.

Ans.—(2) The same as in the case of the transformer, namely, 15,000 lines per square inch.

Ques.—(3) What is meant by a "capacity coupled" transmitter or receiver?

Ans.—(3) As far as we are aware no definition has been given for this term, but it refers, in the case of transmitting apparatus, to a set where the closed oscillatory circuit is electrostatically coupled to the antenna circuit; in other words, a large plate of copper is connected in series with the antenna and a similar plate in series with the closed circuit. The plates are placed in inductive relation to each other so that the electrostatic field of the plate in the closed circuit will act upon that of the open circuit. Often a condenser is connected in series with the antenna, which is also an element of the closed oscillatory circuit. This type of circuit is sometimes referred to as being one employing electrostatic coupling, but it is rather a misuse of the term. In any oscillation transformer, whether used for transmitting or receiving purposes, there is a certain amount of electrostatic coupling, namely, a capacity effect between the turns of the primary and the secondary circuit, and, of course, a small amount of energy is thus transferred.

Ques.—(4) Is a closed or open core type of transformer the most efficient for wireless work, using a quenched spark gap?

Ans.—(4) It is entirely a matter of design. Either type of transformer is efficient and will serve the purpose, provided it is properly constructed. The closed core transformer is generally cheaper to build and takes up less room, but it is not any more efficient than an open core transformer.

Ques.—(5) What is the real difference other than that it lasts longer between the "Hudson" filament and the standard tantalum filament as used in the audion detectors.

Ans.—(5) The "Hudson" filament is supposed to be more sensitive and for the reception of undamped oscillations the statement is quite true. Used in the ordinary manner, there is little to be said between the two types of filaments. It is very noticeable with the "Hudson" filament that the vacuum of the bulb steadily increases and it is necessary from time to time to add additional voltage in the local battery circuit or, of course, the vacuum may be reduced by the application of a small blow or alcohol torch.

* * *

S. F. L., New Rochelle, N. Y.:

We have read your communication carefully and advise that it is impossible to build a receiving set which will have an efficient range from 180 meters to 7,000 meters. You should construct two distinct receiving tuners, one to have a range of from about 100 meters to 1,000, and another to have a range from 1,000 up to 7,000. As a matter of fact, a receiving apparatus suitable for 7,000-meter work is not even the proper equipment for 1,000-meter work. A tuner for the longer wave-lengths should begin at about 4,000 meters and can be efficiently operated between wave-lengths of 4,000 and, say, 12,000 meters. Unless you have extremely sensitive receiving apparatus a small aerial having a natural period of 180 meters is not large enough to be operated on a wave-length of 7,000 meters. The receiving tuner referred to in your communication, in connection with the aerial as described, will give a wave-length adjustment in the secondary circuit of about 3,000 or 4,000 meters and in the primary circuit from 2,000 to 2,200 meters.

* * *

R. S., Pittsburg, Pa., writes:

Ques.—(1) Can you tell me if there is an account in any of the back numbers of THE WIRELESS AGE in reference to the invention of a wireless aerial that does not require a great height to bring good results?

Ans.—(1) In the lecture delivered before the New York Electrical Society in 1912, by Guglielmo Marconi reference was made to the use of aerials laid over the surface of the earth by the Italian army in the Sahara Desert. There has been no distinct "invention" made along this line, but it is a fact that for receiving purposes the aerial need not be so high as for sending purposes.

* * *

R. E. R., Kansas City Kans.:

You can secure information on the construction of a Tesla coil in a book entitled "Tesla High Frequency Coils," by Haller & Cunningham. Communicate with the Book Department of THE WIRELESS AGE; the price is $1.25.

* * *

H. C. S.:

Ans.—(1) The loose coupler (the inductively-coupled receiving tuner) is preferable for your work. For a loading coil a single coal with a multiple point switch is quite sufficient.

We do not know the cause of the undertone in KET'S spark.

The KPA (Seattle, Wash.) station of the Marconi Company is equipped with a 500-cycle transmitter.

The wave-length of the KSS (South San Francisco Poulsen station) is about 8,000 meters, and the NPL (Point Loma, Cal., Poulsen station) about 6,000 meters.

We have no record of the stations with the prefix "X" which you give, but it is likely they are Mexican stations located either on the Carribbean or Pacific coast.

* * *

E. D., Scranton, Pa., asks:

Ques.—(1) How many feet of wire are required to make a loading inductance to boost the following described aerial to a wave length of 5,000 meters? The aerial is 75 feet in length by 35 feet in height, consisting of four wires. The wire for the inductance is to be No. 32.

Ans.—(1) You require a loading coil 5 inches in diameter by 24 inches in length, wound closely with No. 20 or No. 22 S.S.C.

wire. No. 32 wire is entirely too small for this purpose.

Ques.—(2) On what wave-length does the Wanamaker station send?

Ans.—(2) Twenty-one hundred meters.

Ques.—(3) What is the wave-length of the aerial described. The lead-in is 15 feet in length.

Ans.—(3) The wave-length is about 190 meters.

Ques.—(4) Can I receive from the Key West Naval station with the aerial mentioned, the equipment consisting of an inductively-coupled receiving tuner adjustable to 1,000 meters, Blitzen variable condenser, Murdock detector and 2,000 ohm head sets; the ground connection to be made to the steam pipe and the gas pipe?

Ans.—(4) If the receiving tuner has a maximum wave-length adjustment of only 1,000 meters your apparatus is not in resonance with the Key West station, the normal wave-length of which is 1,600 meters. The wave-length of this station, however, can be attained by connecting a loading coil in series with the antenna. This loading coil should have dimensions similar to the primary winding of your receiving tuner. The signals for Key West will not be heard at your station in daylight but at night time, only, and during the colder months of the year.

Ques.—(5) What detector besides the vacuum valve is the most sensitive?

Ans.—(5) The vacuum valve detectors are considered the most sensitive of all. A double or triple vacuum valve detector will, of course, be more sensitive than a single valve. Galena or cerusite are next to the valve detectors in the matter of sensibilty.

* * *

Lieutenant F. M. H., Cornwall-on-the-Hudson, N. Y., asks:

Ques.—(1) What should be the natural period of my aerial? It is 68 feet in height, 85 feet in length, consisting of six wires on 11-foot 6-inch spreaders; the lead-in is 40 feet in length and the ground lead 43 feet? I have seen several articles on wave- lengths of four wire aerials but none on six wire aerials. How much difference should there be?

Ans.—(1) There is not a great difference in the wave-length of an aerial between four and six wires; it, of course, depends largely upon the spacing of the wires. The natural wave-length of your aerial is about 305 or 310 meters.

Ques.—(2) Please tell me what effect the shape of the ground lead (and lead-in) have on the effective range *i.e.*, the effect of three angles, one of them being greater than right-angles?

Ans.—(2) If this aerial is used for transmitting purposes these sharp angles will have no bad effects unless very high potentials are employed at the transmitter. For receiving purposes the losses are not sufficient to consider. One thing, however, is important—the primary winding of the receiving tuner in a receiving set should be as near to the actual earth connection as possible.

* * *

Ques.—(3) How should the work of the aerial described, as a receivng aerial, compare with that of a single wire about 500 feet in length, the average height to be at least 50 feet? Would I be able to get amateurs, using a series condenser, as well as I now can with a few turns of my tuner?

Ans.—(3) The first described aerial is by far preferable for receiving from amateur stations. The single wire aerial, 500 feet in length, is suitable for reception of the longer wave-lengths, say from 1,600 meters up; but it is entirely too long for the efficient reception of amateur signals.

Ques.—(4) With the aerial described, Murdock oscillation transformer, rotary spark gap giving 720 sparks per second, a 1 k.w. Thordarson transformer (secondary voltage 20,000), 6 sections Murdock molded condenser in parallel, what should my average sending range be? Is the condenser capacity correct and should I not use series parallel connections to stand the voltage?

Ans.—(4) On the basis that the capacity of the Murdock condenser unit is .0015 microfarads, 6 sections in parallel will give the correct capacity. We do not believe, however, that these condensers will withstand 20,000 volts and you should therefore employ a series parallel connection. You thus require 24 sections, 12 in parallel in each unit and the 2 units connected in series. Your sending range is about 80 miles.

Ques.—(5) I have a Type RJ-4 vacuum valve and have been trying to get a diagram of connections for amplifying the signals from a crystal detector. I know this is possible as I have visited several stations that used this method and I know that a 1 to 1 transformer is essential. Is this the same transformer used for amplifying the signals from one vacuum valve by another and what is the diagram of connections? I believe this diagram appeared in THE WIRELESS AGE some time ago, but I searched all my old copies for it without success.

Ans.—(5) The January, 1914, issue of THE WIRELESS AGE contained a complete circuit diagram for amplifying from a crystal or from one vacuum valve to the second vacuum valve. The 1 to 1 transformer employed may be the same for either method. A little experimenting will give the best results. It is not necessary to wind a transformer especially for this purpose; the secondary winding of an induction coil or power transformer may be used. If you desire to amplify the signals from a crystal detector, care should be taken that there is sufficient voltage in the local battery for the crystal to overcome the resistance of the 1 to 1 transformer. The issue of THE WIRELESS AGE referred to will help you.

* * *

I. D., Council Bluffs, Ia.:

We do not answer questions by mail, but in reply to your several queries we advise that none of the circuit diagrams you provided for use with the vacuum valve amplifier, are cor-

rect. We suggest that you secure a copy of the January, 1914, issue of The Wireless Age, and read the article, "How to Conduct a Radio Club."

The 1 to 1 transformer described in your second query is inoperative. Instead of building a special transformer you might employ the secondary winding of a spark coil or transformer.

The degree of incandescence of the filament, for the best results with an amplifier, can only be ascertained by experiment.

Dry battery carbons are not satisfactory for the electric arc. Standard arc light carbons are much harder than those used in dry cells.

* * *

J. M., Hartford, Conn.:

There have been no articles published in The Wireless Age on the construction of a loud-speaking telephone. The latter may be purchased from the Western Electric Company, New York City.

* * *

J. S. D., Brooklyn, N. Y.:

Ans.—(1) WCY (Cape May, N. J., station) sends press on a wave-length of 550 meters.

With a 200-meter aerial and a 1/4 k.w. set operated on 60 cycles source of energy you need not expect more than 1 1/2 amperes in the antenna circuit.

Ans.—(3) The transmitter of the wireless telephone should be connected in series with the earth lead connected to the secondary winding of the oscillation transformer.

We do not know what station it is that you hear on 600 meters, but we believe that you have made an error in interpreting the call. The call letters of the stations you hear are probably HD and DY, which are British cruisers lying at anchor outside of Sandy Hook.

The letters and figures which you hear from Arlington previous to the wind reports are abbreviations which indicate the general weather conditions at various points on the Atlantic Coast and Great Lakes. In the Queries Answered Department in previous issues of The Wireless Age these abbreviations have been fully explained. A pamphlet covering the subject can be secured from the Department of Agriculture.

* * *

F. C. S., Bridgeport, Conn.:

Unless you provide a circuit diagram showing the actual connections employed when your receiving detector is disconnected from the receiving circuits, we cannot give a definite reason for still hearing the signals. Comment was made on this subject in previous issues of The Wireless Age in the Comment and Criticism department, but no definite conclusions were arrived at.

* * *

A. D., Port Townsend, Wash.:

We should not advise you to attempt to put additional turns on the 1 k.w. Clapp-Eastham transformer without consulting the designers. A potential of 8,400 volts is rather low for work on 200 meters. A transformer for amateur purposes should have a secondary potential of between 12,000 and 15,000 volts. Of course you will be able to make use of this transformer, but not at its full rated power on a wave-length of 200 meters. Using a rotary spark gap with 60 cycle source of energy in connection with this high potential transformer, it is doubtful whether you could make use of more than 1/2 k.w. at the extreme. This is due to the fact that the condenser of the spark gap circuit is limited in size by the wave-length desired.

* * *

H. W. B., Kingston, N. Y.:

The data given in your first query are insufficient to solve your problem. It is a fact that stations outside of the daylight range of a given receiving station often fade out during the reception of signals for reasons other than the local conditions at either the sending or receiving station, but inasmuch as the arc light induction and the telephone induction disappear simultaneously with the strength of signals, we are inclined to believe that there is a loose contact somewhere in your aerial system or that your wires are swinging and actually touching other wires. Perhaps the difficulty may lie in the galena detector, which is rather difficult to keep in adjustment.

Ans.—(2) The Wanamaker stations generally work at a speed of about 30 words per minute. The wave-length of the New York station is 2,100 meters.

WSK is the Marconi Commercial Station, located at Sagaponack, L. I.

The Year Book of Wireless Telegraphy for 1914 contains a complete map showing the wireless stations of the world.

* * *

F. W. K., Superior, Wis., asks:

Ques.—(1) I have had considerable trouble regarding the fading out of the signals from my set. Does the fact that there are a range of 700 feet hills at Duluth just north of me, iron ore beds eighty miles north and copper mines 150 miles north-east, have any bearing on the matter? I have a very good earth connection which is in moist clay.

Ans.—(1) Without doubt these hills have a detrimental influence on the radiation from your station, but inasmuch as we have not all the facts in the case it is difficult to reply definitely. Are the receiving stations, which copy your signals, within the daylight range of your station? If so, there is something radically wrong at your transmitting station. Perhaps the antenna wires swing near to other wires and cause leakage, there may be a loose connection in the lead-ins or the earth connection may not have sufficient area. The iron ore beds eighty miles away or the copper mines 150 miles in another direction will have little influence on your local work. There seems to be leakage somewhere in your set.

Ques.—(2) What number of amperes will "blow" 5 No. 34 German silver wires in parallel?

Ans.—(2) It depends to some extent upon the length of the wires, and the specific resistance of the German silver, but speaking generally, these 5 wires in parallel should carry about 1/2 ampere.

RADIO RAVINGS

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It was in Jacksonville that the most dignified key manipulator in the Marconi service bought a handful of ballads from street venders who were bawling out their contents to a gaping audience. Proceeding on his way, he noticed as he neared the dock that he was followed by a dozen or more urchins, their faces beaming with expectation. "Well, boys, what is it?" said he.

"Huh!" said one, his voice tinged with disappointment, "that's one on us! After coming all this way, too."

"But what are you waiting for?" said the astonished operator.

"Waiting for! Why, ain't you going to sing, mister?"

* * *

Oh, Sparks was a gallant young Mr.,
And he loved his girl so that he kr.
She said, "Here, now, you
Stop that P. D. Q.,
I can love you but as a sr."

Take it from old Frank Adams and every new operator on the sea, these submarines should all be named C-6.

* * *

Haven't the faintest idea who makes up the cash account for Hatteras, but George insists that if this mysterious individual caught the measles he would be a spotted adder.

* * *

Lemuel is wrong about our editor. He's still quite sprightly and chipper. That he hasn't fallen for any of Lem's contributions is no sign that he's reached his declining years.

* * *

Never ask questions like that, Lem.

* * *

Ask, f'rinst'nce: Who's his girl?

* * *

You do ask, eh? . . . well (quietly now)—Ida.

* * *

Ida who?

* * *

Ida know.

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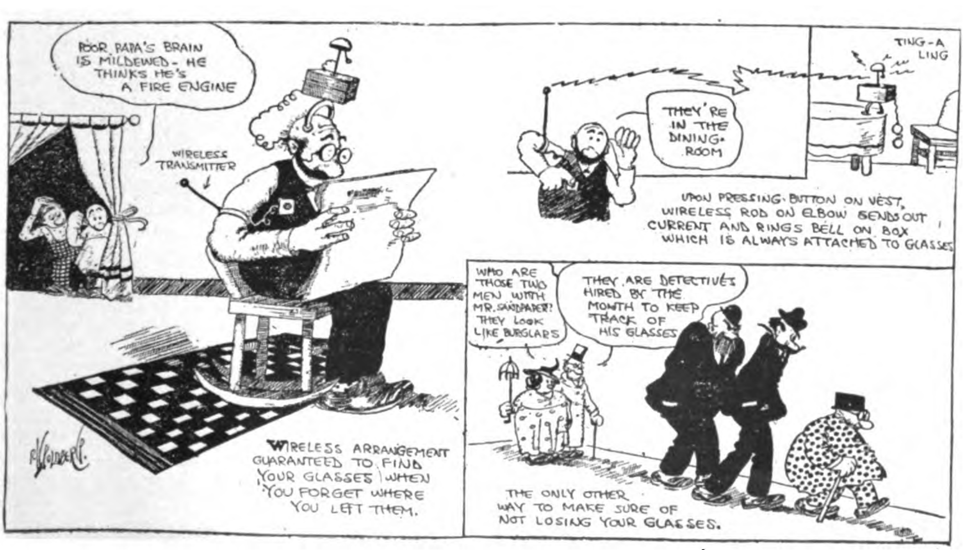

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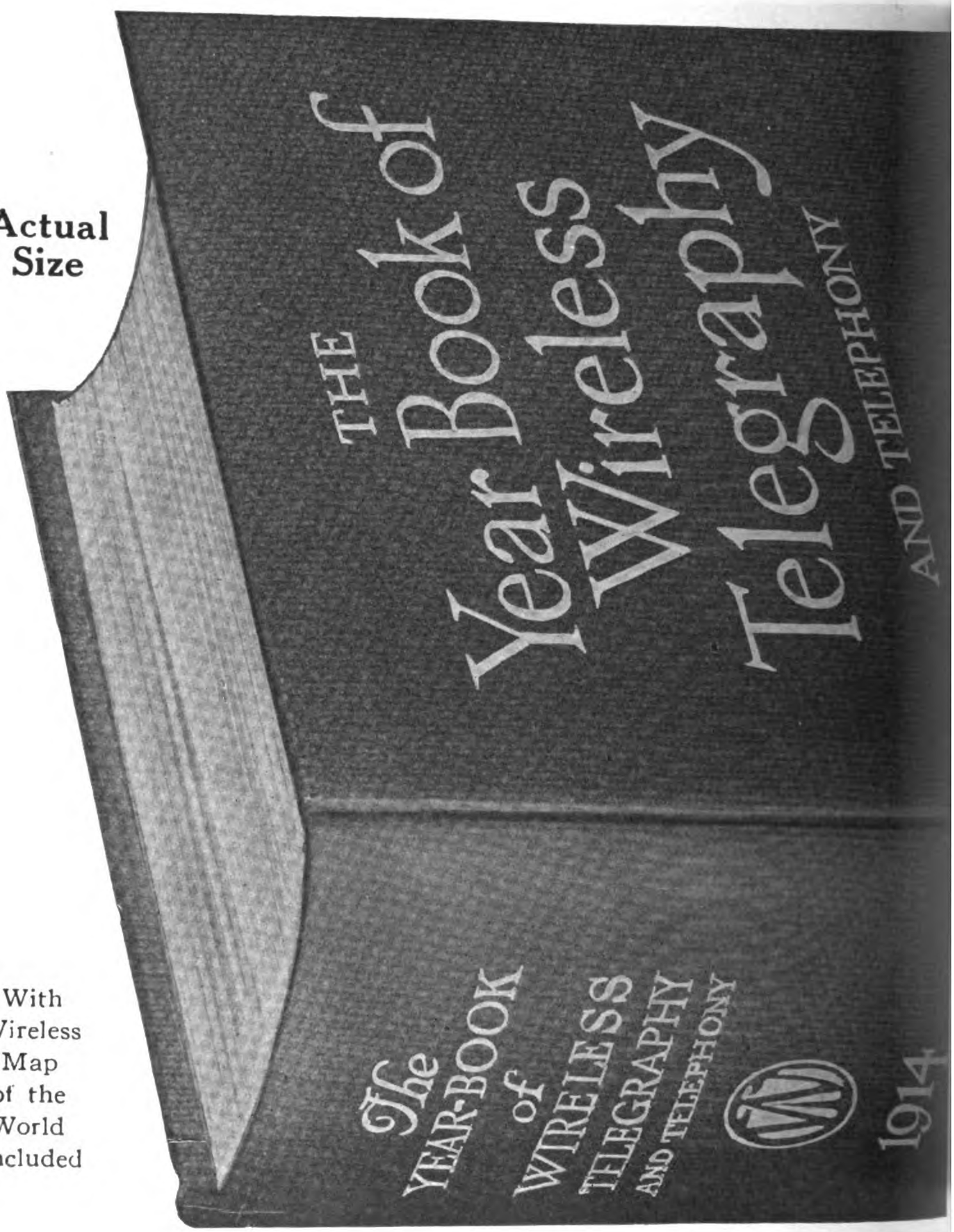

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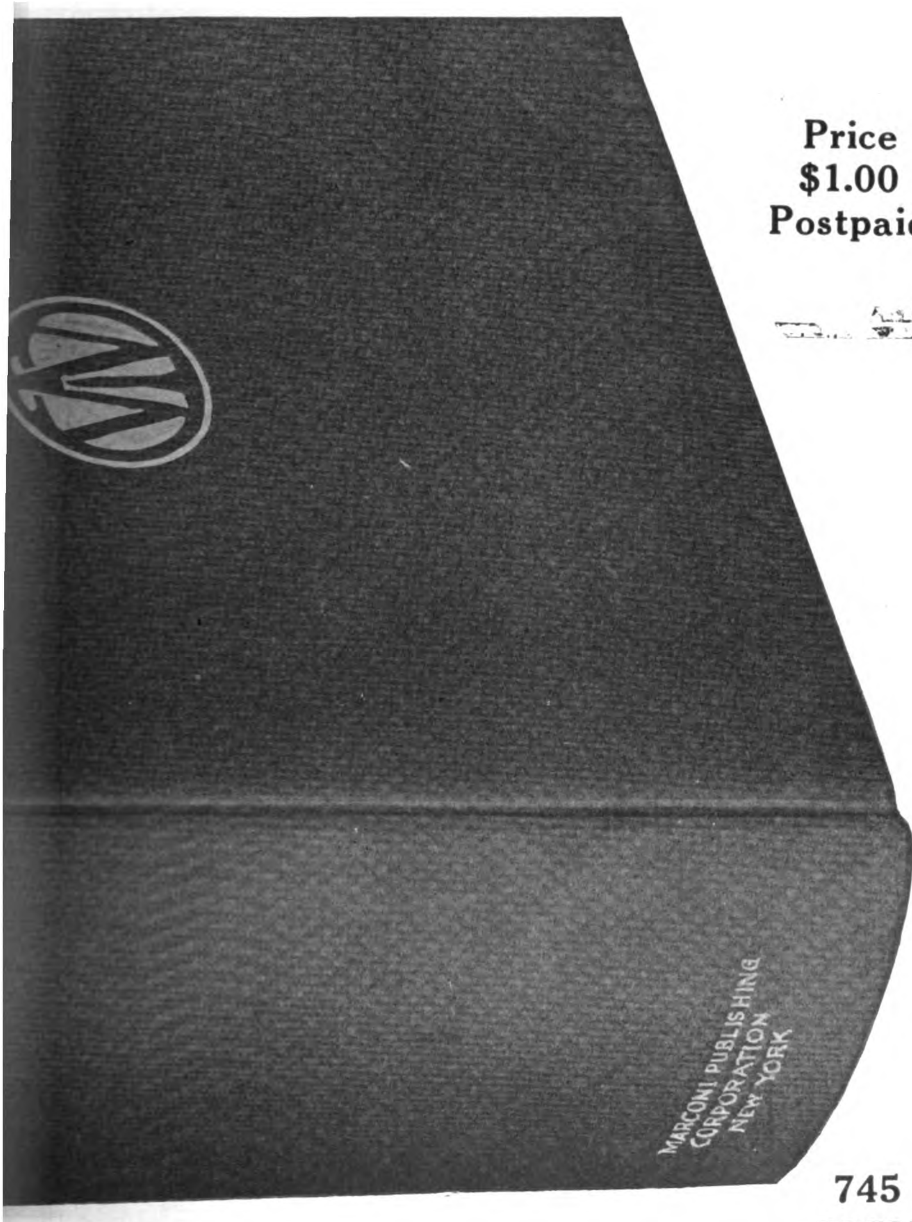

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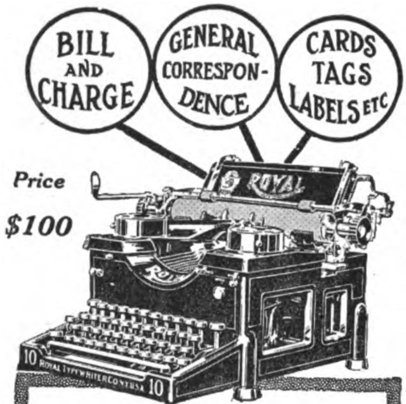

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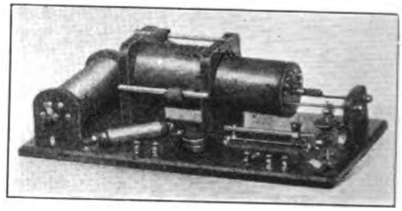

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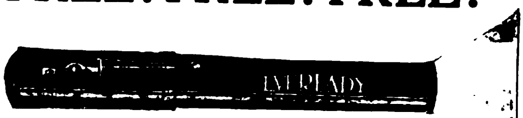

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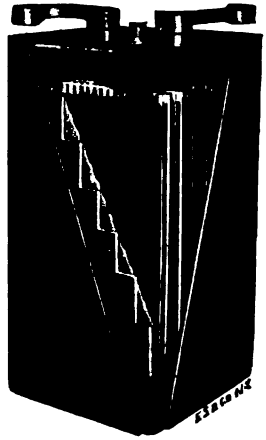

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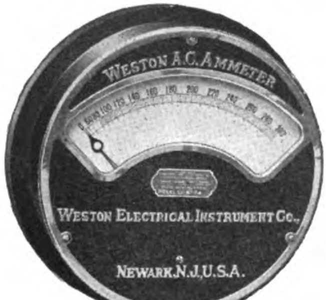

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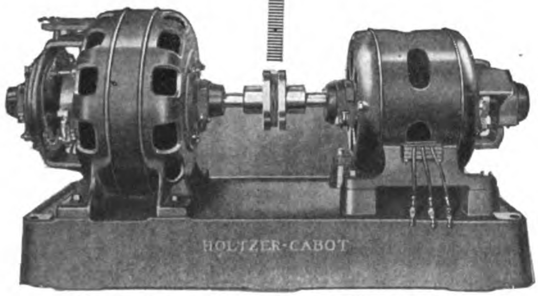

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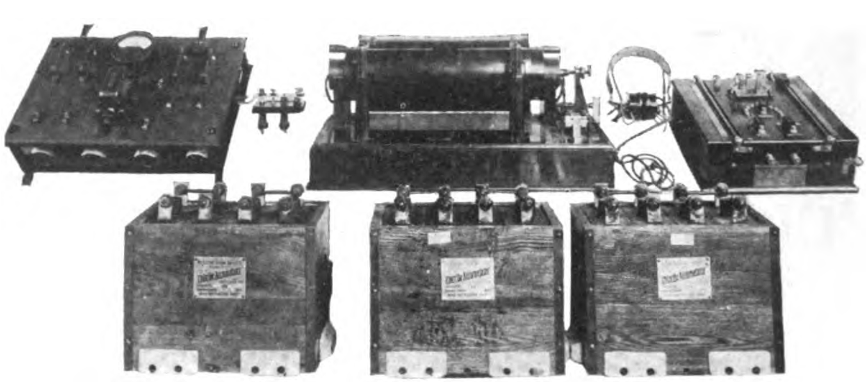

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Every reference to "Marconi", whether written or spoken, is a reminder of a great service rendered to mankind. It is our company's privilege to bear a birthright founded on one of the greatest of all man-given benefits to humanity. Let us be worthy of it, and of its ideal, and in so doing, build character for ourselves and promote the fair fame and prosperity of our company.

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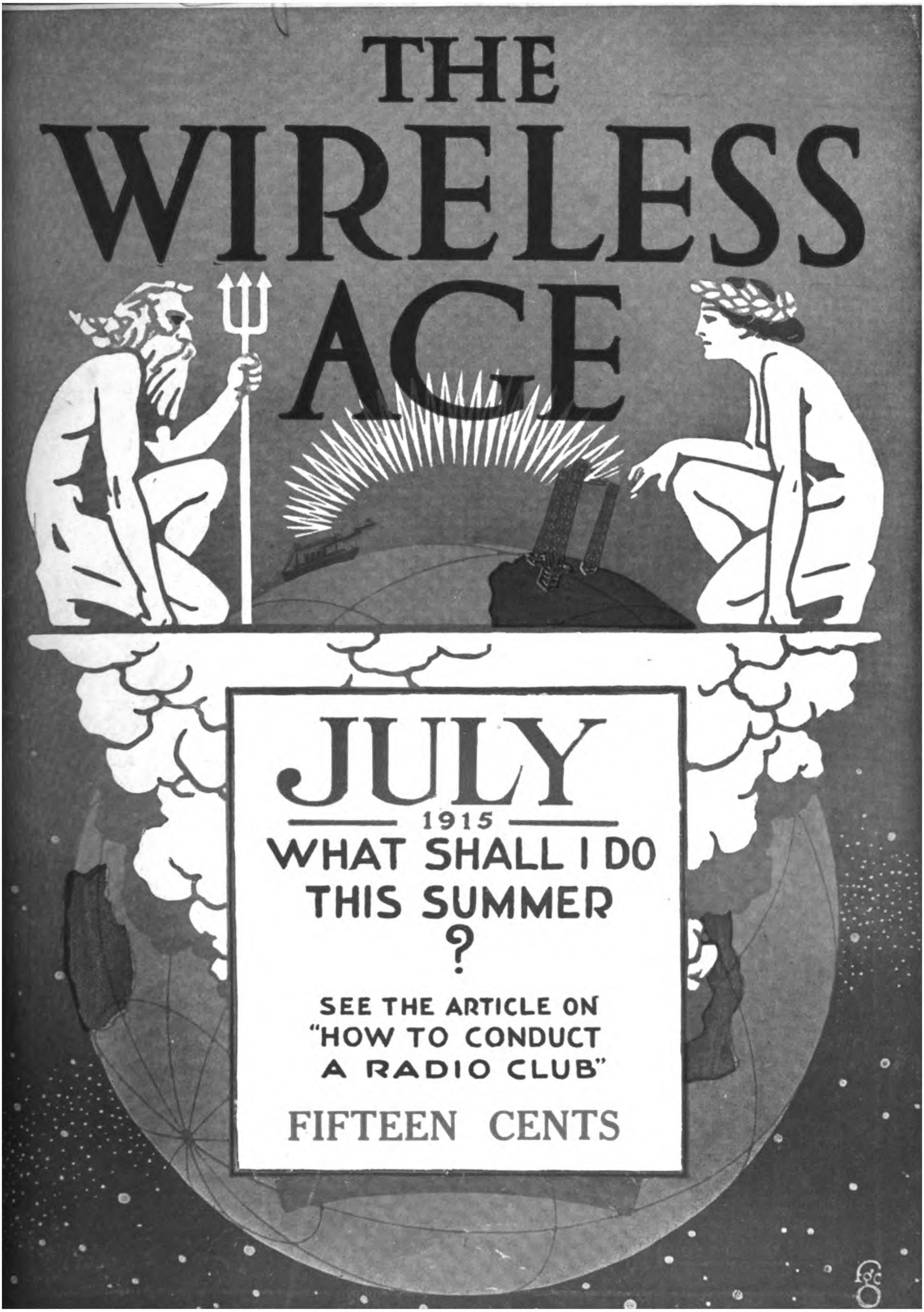
Vice President and General Manager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Volume 2 (New Series) — **July, 1915** — **No. 10**

CONTENTS

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THE WIRELESS AGE

Owing to the fact that certain statements and expressions of opinion from correspondents and others appearing in these columns from time to time may be found to be the subject of controversy in scientific circles and in the courts, either now or in the future, and to sometimes involve questions of priority of invention and the comparative merits of apparatus employed in wireless signaling, the owners and publishers of this magazine positively and emphatically disclaim any privity or responsibility for any statements of opinion or partisan expressions if such should at any time appear herein.

JULY, 1915

The Ownership of Wireless Equipment

Another Vindication of the Claims of This Magazine in Open Forum Discussion

SUPPLEMENTING the comments on the March number's article which were printed in last month's issue, an interesting contribution to the discussion on the proper ownership of wireless equipment has been received from a wireless man of long experience. This reader has requested that his identity be covered by the signature "Veritas." His address to the Open Forum is as follows:

"I cannot be charged with partiality to either side of the discussion, as I am not now engaged in the wireless service, but I have had personal experience therein in the past with different corporations, and under the varying circumstances referred to in the publication.

"It goes without repetition, or even assertion, that one general and responsible operating company, supplying all steamship lines with a standardized outfit and covering the apparatus with its own personally controlled force of operators and other auxiliary employees, such as repairmen, inspectors, etc., is, and should be, productive of more valuable service to the interest of the steamship companies and the public than the confused and mixed up state of affairs that exists at present, and which shows a tendency to become worse.

"While it is true, as your pamphlet asserts, that the Marconi idea of renting instead of selling outright the various types of apparatus as they came out, resulted in the present quite extensive growth of the use of wireless generally, still business men or steamship officials do not think of or care for that feature.

"They look at the situation as they find it now. It is 'to-day' with them, and dollars and cents saved is the goal in view.

"Two features or objects, as far as I can ascertain, actuate steamship company officials in preferring to purchase and own their wireless apparatus and engage the services of their own operators. They are cheapness and efficiency, in the order named.

"It should, however, be understood and remembered that the 'wireless service' as an income yielder to its originators and investers is not, and has not, been a superlatively attractive one. And it is owing chiefly, if not solely, to the beliefs of its inventors and friends and overwhelming confidence in its future convictions—supported by literally pouring money into its creation and development—that we have any wireless service at all to-day.

"Steamship companies, like individuals, are skeptical as to the real worth of a thing until it has been thoroughly tried out. And then they want the cost price cut down to the last dollar. Right there is where the growth and progress of wireless service has been delayed.

"Competition has been so profusely and often so recklessly pushed that apparatus has been installed on ships for next to nothing, and in some cases, absolutely free; months elapsed before any rentals were earned.

"The wireless companies incurred heavy expense in exploiting their systems, and upon closing of contracts pro-

viding a probable fair return therefor, the steamship companies threw up their hands in horror, thus clearly showing their ignorance of the primary cost of apparatus, and their unbelief that the service itself would or could be of any importance or benefit to them.

"In addition to this original cost, the wireless companies were bound to maintain all repairs, a rigid mechanical inspection in port and, by inference at least, were pledged to introduce all new inventions and improvements as they might be developed.

"Last but not least, the skilled operator to make the expensive and intricate apparatus available and serviceable, was to be furnished by the wireless company. In fact, all the risk and responsibility of every kind was put up to the wireless company.

"This low rate of income prevented the wireless company from paying its operators such salaries as would naturally attract older and more experienced men to the service, preferably, of course, those of years in the land telegraph service. The result was that in the early days of wireless a great many quite young and sometimes erratic and irresponsible persons were perforce accepted.

"A recent decision of the United States Court plainly asserts that the lately increased leased rates charged the steamship companies are still just, fair and reasonable, and when you stop to consider the importance of the wireless in an emergency—when no other form of assistance can take its place—then indeed its cost, whatever it may have been, instantly becomes insignificant.

"Another feature which is often entirely unthought of, or else belittled or even ignored, in the daily working of the wireless, especially while at sea, is that of community of interest, or in common every-day lingo, just 'comradeship,' and this sentiment obtains especially between ships, as distinguished from direct shore communication. How often have we said mentally, 'Why does not ZYX answer us? He has just answered a ship apparently in our range.' And again, 'It's no use calling ZXY, he won't answer us and handle our business, even to get the extra relay tolls, for he is a competing ship.' Then again we remember the bickering, struggling for circuit, and mutual recrimination about interfering, knowing or believing that 'reporting to headquarters,' will bring no result, as the steamship company to whom the offending ship belongs will either pigeonhole or ignore the complaint, or else say to its operator, in effect, 'You look out for our own business and get it off; never mind the other fellow.'

"Now one controlling operating company can stop all this, or at least greatly minimize its evil effects. All business would look alike to it, and its operators would make only such distinctions as the International Radio Laws and instructions authorize.

"A high steamship official once said to me as one reason why his company preferred engaging its own operators, 'I want steady and responsible men, and not a lot of kids who change around after one or two trips. I've had nineteen different operators in twenty-two sailings.' My suggested explanation that three things might have conduced to the transitory feature he complained of elicited a stony stare; for I named them as being, perhaps, poor sleeping and working accommodations for the operators, inferior food and inadequate salary. I record the fact that the first wages under his new personal regime were for the first and second operators ten dollars and five dollars more per month respectively than their predecessors had received. This showed his appreciation of the wireless service, though it is possible he made up the salary increase by the cheaper apparatus he had installed.

"If the latter worked as good as the equipment which it displaced, then he is the gainer thereby to a slight extent; but his company's wireless business, as well as that of the public emanating from his ships at sea, still suffers from the objectional features before mentioned.

"If looked at in the correct and fair light of visible facts the steamship companies are getting a very necessary service at a very reasonable cost. When they go abroad, or even along the coast, tourists and regular travelers invariably prefer ships carrying wireless to those not so guarded and protected, and its beneficent value is so apparent nowadays that national laws compel various

steamship companies to provide this novel and useful invention. The marine insurance companies, it is said, recognize its value by conceding a reduction in premium on the insurance carried on the vessel and cargo.

"Administration is fully as important and necessary as good apparatus; and responsibility to be effective must be concentrated and not divided.

"The extra expense incurred by steamship companies which own their apparatus and engage their operators in maintaining the rigid inspection necessary to insure continuity of efficiency in the installation (looking after repairs, etc.) is no inconsiderable item. The Government standard must be maintained or penalizing may result; the ships held up till the delinquencies are remedied. A responsible operating company takes care of all these features, even to providing operators at the last hour before sailing in case sudden and unavoidable conditions prevent the regular man from reporting on duty. Its standard of efficiency is coincident literally with that of the Government, and hence no uneasiness of mind need ever trouble the steamship officials.

"Immense sums have been spent in recent years in litigation by the different wireless companies, and much is still being expended by them to obtain a permanent legal status for the different patentable features each respectively claims to control.

"Until these suits have been finally adjudicated by the highest legal tribunal in this country the wireless service will probably continue to be somewhat chaotic for the reasons already given. But indications are that the major company now controlling the far greater portion of the wireless service of the world will soon have its superior claims definitely passed upon, and for all time."

(Signed) "VERITAS."

From a Half Dozen Friends in as Many States

THE WIRELESS AGE is worth ten other so-called wireless magazines.—H. A. D., *New York.*

* * *

It is a "dandy" magazine, and strikes everybody right.—J. D. B., *Iowa.*

* * *

Kindly mail the November, 1913, issue to the address given below as soon as possible. With this issue, I will have every copy of THE WIRELESS AGE to date. I would not part with them for any amount, as I have received more benefit from them than from some of the very best wireless books. I always refer to the copies of THE WIRELESS AGE as my best wireless friends. They sure are great.—J. P. L., *Ohio.*

* * *

I have only received three issues of THE WIRELESS AGE, but I think it is the greatest magazine ever published.—G. S., *Alabama.*

* * *

Your magazine cannot be surpassed in any way. I am treasurer of the ——— Radio Club of this city, and I shall not fail to have the Secretary, as well as myself, recommend it to everyone in the club. Words cannot do justice to its good merits.—H. W. O., *Massachusetts.*

* * *

I received my first copy of your magazine and will never be without it now. It contains a fund of information and is worth twice the price.—R. C. A., *Pennsylvania.*

Court Restrains Infringer

National Electric Signaling Co. Secures Injunction Against Vaccaro Bros. in New Orleans

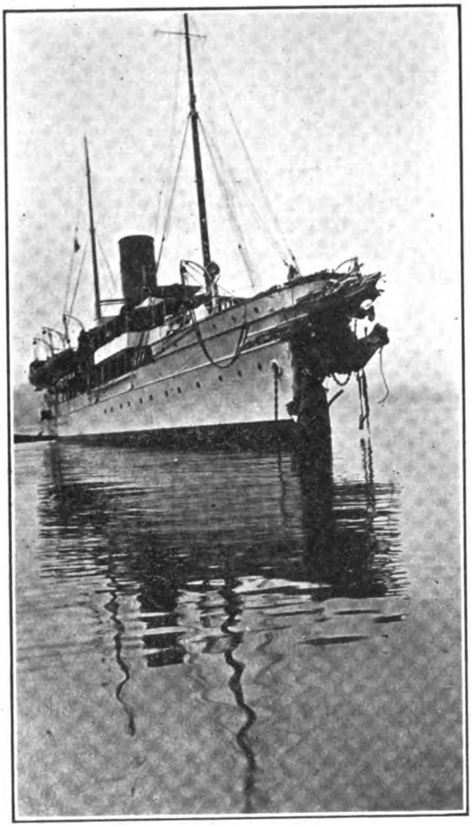
ON May 25 Judge Rufus E. Foster of the U. S. District Court in New Orleans issued an injunction in behalf of the receivers of the National Electric Signaling Company against Vaccaro Bros. and others, restraining them from further manufacturing, selling or using apparatus involving the inventions covered by the patents in suit. The injunction allowed thirty days for removal of the infringing apparatus.

The basis of the action lies in the Fessenden patents, Nos. 918, 306 and 918, 307, issued April 13, 1909 and transferred to the National Electric Signaling Company. Testimony was given for the plaintiff by Frederick M. Sammis, chief engineer of the Marconi Company, A. Mowat, and Samuel N. Kintner of the National Company. M. E. Hart and Howard Benedict Ayres filed affidavits on behalf of defendants. The injunction as issued reads in part:

"Said patents have been held to be valid and infringed by the Court of Appeals for the Third Circuit, and that said defendants, Vaccaro Brothers and Company, Vaccaro Brothers Steamship Company, Ltd., M. E. Hart, Enterprise Electrical Company and Gulf Radio Company, have infringed on the rights secured by the aforesaid Letters Patent by making, using and selling wireless telegraph apparatus embodying or containing in its construction and mode of operation the inventions set forth in said Letters Patent, Nos. 918, 306 and 918, 307, and each thereof, contrary to the form of the statute in such cases made and provided; and upon consideration thereof, it was ordered, adjudged and decreed, as follows:

"That a preliminary injunction be issued pursuant to the prayer of the bill of complaint herein, strictly commanding and enjoining the defendants, Vaccaro Brothers & Company, Vaccoro Brothers Steamship Company, Ltd., M. E. Hart, Enterprise Electrical Company and Gulf Radio Company, and each of them, their several clerks, agents, servants, workmen and attorneys, under the pains and penalties which may fall upon them, and each of them, in case of disobedience, that they forthwith and until the further order, judgment and decree of this Court, desist from directly or indirectly making or causing to be made, advertising or offering for sale, or causing to be advertised or offered for sale, agreeing or contracting to sell or causing to be agreed or contracted for sale, selling or causing to be sold, using or causing to be used, leasing or causing to be leased, supplying or causing to be supplied, installing or causing to be installed, or disposing of or causing to be disposed of in any manner, any device, structure, appliance or wireless telegraph apparatus embodying or containing in its construction and mode of operation the inventions as described and claimed in the said Letters Patent, or either thereof, or the essential or material parts of such apparatus to be used in a wireless telegraph system embodying the inventions of the said patents, or either thereof, provided that the defendants Vaccaro Brothers & Company are hereby granted thirty days from date hereof for installation or substitution of non-infringing apparatus, subject to further extension of time on proper showing of necessity therefor."

Wireless An Aid In Three Wrecks



How the Vanadis looked after she had been in collision with the Bunker Hill

There was another addition to the long list of rescues effected by the aid of Marconi wireless and wireless men on the morning of May 26 when the Holland-American liner Ryndam came into collision with the fruit steamer Joseph J. Cuneo south of the Nantucket Shoals. Following the crash, water poured in torrents into the hole which the Cuneo had torn in the side of the Ryndam. Nor did the fruit steamer escape undamaged, for her bows were stove in and she made water rapidly. On the Ryndam were B. Moree, first operator and A. T. A. LeClercq, his assistant. They sent the S O S broadcast while the passengers and some of the ship's company were being transferred to the Cuneo. A few hours after the appeal had been flashed several United States warships arrived. one of them receiving those who had been taken to the crippled Cuneo—230 in all. No lives were lost. The following story of the accident was written by Operator Moree:

Operator Moree's Account of the Collision between the Ryndam and the Joseph J. Cuneo. The Bunker Hill and the Vanadis in a Crash. The Stranding of the Minnesota.

THE Ryndam left New York on May 25, bound for Rotterdam, under the command of Captain P. Van den Heuvel, the voyage proceeding smoothly enough until the following morning. I had been on duty during the night, my assistant, Le Clercq, relieving me a short time before daybreak. When I fell asleep there was no thought of untoward happenings in my mind; you can well imagine my sensations, therefore, when I was awakened by a violent shock. At first I thought something had happened to our aerial, but even as I was speculating regarding the matter Le Clercq appeared and told me that we had been in collision with another vessel. I leaped out of my berth and, looking out of a port hole, saw that lifeboats were being low-

ered and that preparations were being made to take the passengers off the vessel.

The sight was real enough to convince me that I was not dreaming and, hurriedly dressing, I took my place at the wireless set. Soon afterwards the chief officer came with an order to send the S O S. We were then about twenty-six miles south of the Nantucket Shoals. While I flashed the signals my assistant busied himself carrying messages to and from the wireless room to the bridge. The wireless appeal was answered without delay by battleships of the Atlantic fleet manœuvering near Nantucket Shoals, the steamships North Star and Cretic also responding. The Wyoming of the Atlantic fleet said that several battleships were coming at top speed to our assistance. This information relieved the anxiety among us, due to the fact that our ship had a big hole in her port side amidships, extending nine feet under the water line. Through this opening the water rushed like a small river.

While the exchange of wireless messages was taking place the passengers were being transferred to the ship with which we had been in collision—the Joseph J. Cuneo—bound from Boston to Baracoa, Cuba. She had suffered considerably also, as a result of the accident, a large hole in her bow permitting the water to pour freely into her. The sight of the battleships South Carolina, Texas Louisiana and Michigan steaming toward us, therefore, was welcome indeed. The South Carolina at once lowered her boats and took aboard those from the Ryndam who had been transferred to the Cuneo. Then a wireless conference was held at which it was determined that the Texas should accompany the Ryndam to New York.

We arrived off Sandy Hook at half past eight o'clock and, complimentary marconigrams having been exchanged between the Ryndam and the Texas, the latter left us to join the other vessels of the Atlantic fleet. Thus we returned to the port from which we had started; our vessel was somewhat damaged, but we had escaped life loss and shown again that wireless telegraphy can be depended upon to bring help in time of need.

The collision between the Metropolitan Line steamship Bunker Hill, bound from New York to Boston, with 250 passengers aboard, and C. K. G. Billings' steam yacht Vanadis in a fog off Eaton's Neck, Long Island, on June 13 brought several offers by wireless of aid. Two men were killed and several persons were injured as a result of the accident. Marconi Operators Ingalls and Pitts were detailed on the Bunker Hill. When Captain Holmes, commander of the Bunker Hill, sent a marconigram to New York saying that the vessel was returning under her own steam, some of the vessels which picked up the message volunteered to come to the aid of the steamer. The latter, however, did not require assistance although she had been considerably damaged.

"I was on duty and Ingalls was at dinner," said Pitts in speaking of the accident. "When the collision occurred I looked to starboard, but could see nothing. When I looked over the port side, however, I saw the hull of the yacht. Then I heard the grinding and groaning of timbers and knew that we had been struck. We sent out the CQ and the Commonwealth, of the Fall River Line and several land stations answered. We also talked with the Vanadis. She was willing to stand by, but her assistance was unnecessary."

William V. Moore, Marconi operator on the steam yacht Alberta, anchored in Glen Cove, Long Island, had just received the time signal from Arlington when he picked up the following message from the Vanadis:

"If you have steam on please blow your whistle to guide us; we are coming slowly in. Have had smash."

Moore informed Captain Curtis of the Alberta of the message and that craft blew three blasts at intervals until the Vanadis felt her way to a safe anchorage at Glen Cove. The Vanadis was damaged in the collision, but did not take much water.

An officer of the Vanadis, according to an interview published in a newspaper, said that the fog was so thick that those on the yacht could not see where she was going. Suddenly the forward lookout shouted "Vessel dead ahead!" Efforts were made to avoid the collision, but the vessels came together, the bowsprit, head sails and forward rigging of the yacht being carried away.

Charles F. Trevatt, Marconi operator in charge on the steamship Minnesota, which ran on a reef at the entrance to the Inland Sea in Japan, has forwarded an interesting account of his experiences. It is in part as follows:

"We left Nagasaki, Japan, for Kobe in ideal weather at 4 A. M., on April 11, and passing into the Inland Sea in daylight everything went fine. On the same day at 8 P. M., when I came on deck it was pitch dark, there being no moon. I had just exchanged signals with the Oanfa (GTL) which we had passed earlier in the day, also bound for Kobe, when at 8:46 P. M., there was a terrific jolt; then came two smaller ones. I knew as soon as we stopped that something serious had happened.

"The captain immediately 'phoned from the bridge and said, 'Stand by,' and in a short time he again said, 'Can you get help?' I replied 'Yes,' and told him a Blue Funnel liner was about eleven miles behind.

"Both sets were working fine, but as soon as we struck I at once put on the ship's power to the emergency cells, while I was working, and called GTL. As every one knows around this coast, it is a job, what with jamming and static, to get through, but after giving a good BK and saying SOS slowly, I got GTL and he said he was coming right away.

"I heard the boats being hauled out and, as far as I could judge, everything was working smoothly; of course, I was too busy with the captain's orders to notice anything—whether we were taking water or not, or what damage we had sustained. However, I was informed that right on our starboard bow there was a fair-sized island.

"The Oanfa anchored within the hour about three miles from us, but in full view of our lights, and the captain told them they had better stand by till daybreak as there were rocks all around us; that if the situation became more serious we would tell them to come in closer. The next morning we found that our bow had been considerably damaged; we continued to take water and they decided to try and pull her off. They gave up the attempt, however, and decided to give the salvage company a contract to blast the reef.

"We were marooned on an island with no way of getting ashore. After a dozen attempts (eight divers had been at work blasting for nineteen days) we at last slid off into deep water, just where the steamship Nile sank on the 11th of January last. We came to Nagasaki under our own steam and put into drydock.

"The captain is very much pleased with our work. The trouble out here is the jamming. They stop for nothing. Soon after we struck a cruiser came and stood by, but it was more of a nuisance than it was worth. It kept on through the night working with other ships and, being so near, I leave it to you to guess what jamming a battleship can do. But after all we got through with our service which is the main thing."

HOW AFRICA KEEPS IN TOUCH WITH EVENTS OF THE WAR

An explorer and elephant hunter has written as follows from Bangui, French Equatorial Africa, to a newspaper:

"It will interest your readers to know that thanks to wireless linked up by land services, we—in the heart of Africa (over 6,000 miles from Europe)—receive daily reports of the progress of battles now raging in Europe a few hours after the events."

WIRELESS WAR NEWS IN THE ARCTIC

How the news of the outbreak of the European war reached the Russian naval officer, Vilkitsky, an Arctic explorer, in Bering Strait, is told in a newspaper dispatch from Petrograd. Vilkitsky, who has been heard of by wireless, left Vladivostok, planning to attempt the Arctic passage from east to west. He was not aware that hostilities between the Allies and Germany had begun and obtained the information from a wireless source somewhere in Bering Strait.

Wireless and War at Sea

"SINCE the last great naval war was waged in Europe, a century ago," says Archibald Hurd in an article on "Wireless and War at Sea," in "The Year Book of Wireless Telegraphy and Telephony" for 1915, "remarkable changes have occurred in the construction of ships, in their defensive and offensive qualities, and in their auxiliary equipment. The principles of naval war are static, but their application has changed and is still changing. The object of hostilities is to defeat the enemy, and in order to effect this purpose it is desirable to know what the enemy is doing in this or that theatre, and to possess means of communication which will enable superior power to be concentrated and exerted against him at the right time and in the right place. It is also essential that the power shall be of the right kind. Sometimes it may be necessary to employ battleships; on other occasions battle cruisers—that is, ships with the speed of cruisers and the gun-power of battleships—may be more suitable, while in other circumstances it may be necessary to use scout cruisers, destroyers or submarines. The more complete and exact the information obtained as to the movements of an enemy, the better will be the arrangements for defeating him, providing the higher command is exercised with competency and sureness of purpose. It may, indeed, be said that in war almost everything depends upon rapid and accurate intelligence."

In articles dealing with the part wireless has played in the European war, published in previous issues of THE WIRELESS AGE, may be found illustrations of the truth of the foregoing. An interesting exemplification is brought out in the story of the destruction of the German raider Emden by the Australian ship Sydney. The incident is related as follows by Mr. Hurd:

"After a more successful career in the destruction of commerce than even the Alabama, of historical fame, achieved, she (the Emden) put into Cocos-Keeling Island and landed a party with the intention of isolating this small community. The wireless operator had time to send out a message for help. The signal was picked up by the senior officer in charge of the cruisers which were convoying transports from the Antipodes to Europe. The information was so full and accurate and was received so rapidly that no doubt existed either as to the identity of the enemy's ship or the possibility of catching her. The senior officer selected for the duty of destroying the Emden the Sydney, of the Royal Australian Navy, a vessel more powerfully armed and swifter than the Emden. Within a few minutes of the signal of distress being dispatched from Cocos-Keeling Island, this man-of-war, cruising many miles away, had changed her course and was bearing down upon the Emden for the purpose of destroying her; and destroy her she did. Wireless telegraphy was thus responsible for the complete destruction of this most famous of all commerce raiders; but for Signor Marconi's invention there is no saying when her career would have come to an end."

The important use to which wireless is put on British battleships of today has been pointed out in THE WIRELESS AGE. Each ship has its wireless installation adjusted so that it can send and receive signals and messages to other squadrons at sea or in harbor and to stations ashore. It is customary for one ship of a fleet to be always in direct touch by wireless with the Admiralty, the risk of interference from an enemy's craft being reduced to such an extent that it is hardly worth while taking into consideration.

"The invention of wireless telegraphy has radically altered the intelligence ser-

vice of the British Fleet, as of other fleets," says Mr. Hurd in touching on this subject. "In former wars in which we have been engaged, communication between the Admiralty and the admirals at sea and between the admirals at sea and the officers commanding the individual ships was slow, uncertain, and often inefficient. The old system of intelligence may be illustrated by recalling the story of the errand of the brig Curieux. Nelson, acting on his unequalled intuition, had chased Villeneuve across the Atlantic, and on June 12th reached Antigua to learn that the enemy had apparently started back for Europe. The British admiral decided to send the Curieux to England with information of the enemy's movements and details of what he himself intended to do. Sailing at her swiftest, she did not reach Plymouth until July 7th. Commander Bettesworth posted at once to London, only to find that the First Lord of the Admiralty, Lord Barham, had gone to bed and that no one dared to arouse him.

How Lord Barham Met the Emergency

"'At an early hour,' Mr. Julian Corbett states in 'The Year of Trafalgar,' the old man awoke and fell into a fury when he knew what had been awaiting him. For it was not only Nelson's dispatches Bettesworth had to deliver, but having taken a more northerly course than the Admiral, who was making for the Straits, he had sighted Villeneuve and determined his course. It was on June 19th, as high as latitude 33° 12′ and in longitude 58°—that is, some 900 miles north-northeast of Antigua—that he had seen him, and the Combined Fleet was still standing to the Northward. Till there could be no doubt Bettlesworth had shadowed them, and then made all sail home with his all-important news. That Villeneuve had stood so far to the northward could only mean he was making for the Bay, and not, as both Barham and Nelson expected, for the Straits. What was to be done? In half an hour Barham had decided.'

"In three hours the orders of the Admiralty had been drafted and the commander of the Curieux was thundering down the Portsmouth road to rejoin his ship, which had in the meantime moved round from Plymouth to Portsmouth. In a short time the brig again put to sea, bearing with her dispatches to Cornwallis which had no little influence in changing the course of European history.

Slow Methods of the Past

"One can imagine how the admirals at sea and the members of the Board of Admiralty chafed under the delay which was imposed upon them, owing to the slow means of communication which then existed. The Curieux, from the time when Nelson decided on his course of action, until Plymouth was reached, was at sea twenty-four days. Then followed Captain Bettesworth's post to and from London, and further delay occurred before the vessel was able to complete the chain of intelligence by communicating with Cornwallis. In the past hundred years steam has replaced sail-power and movement by sea has thereby been rendered more rapid. On the other hand, except where cable communication exists, the Navy of today would still have to rely upon the same slow methods of communication as existed a century ago were it not for the invention of wireless telegraphy. The relation between the speed of the enemy and the speed of the intelligence ship of the opposing ship is now much what it was in Nelson's day. Under the altered conditions, however, a wireless signal 'in code' can accomplish in a few seconds all that the Curieux was able to do in many days.

"Lack of efficient intelligence was under other conditions the bane of the lives of our admirals, as their letters reveal. When Nelson was blockading Cadiz he had to maintain a chain of small vessels which stretched from the enemy's port to the main British fleet, fifty miles away, and the news that the enemy had sailed did not reach him for two and a half hours. Today a single scout cruiser, under steam, could cover that distance in an hour and a half, and no chain of repeating vessels would be necessary; and the enemy, instead of taking 24 hours to maneuver out of port, could complete the operation in one or two hours. Steam in the first place rendered possible a reduction in the number of links in the chain where great distances had to be covered,

but it was not until Signor Marconi invented wireless telegraphy that it became unnecessary to have any chain in any circumstances.

A View of Wireless 16 Years Ago

"The marvels of yesterday are the commonplaces of to-day. We accept the triumphs of wireless telegraphy without surprise or wonderment. And yet how short is the time since this invention appeared and how surprising have all the early anticipations of its triumphs been more than fulfilled! In this connection it is not uninteresting to recall the leading article which appeared in the Times (of London) as recently as August 17, 1899, on the employment of Signor Marconi's system in the naval maneuvers of that summer. It was remarked that 'It has been demonstrated by repeated experiments, conducted under the conditions of actual service, that signals can be transmitted, received and interpreted from ship to ship up to a distance of at least thirty miles, and that their transmission is, so far as we know at present, unaffected by any ordinary meteorological conditions. . . . Thus at a single stroke all existing methods of signalling at sea would seem to be superseded and the effective range of signalling by night or day and in all meteorological conditions is enlarged some five or six fold at least. . . . An electrical contact, alternately made and broken at prescribed intervals, in any one ship will project the required signal, by means of the familiar telegrapic alphabet of dots and dashes, to any other ship within a circuit of thirty miles. Communication with the land can be maintained at the same distance, and the signal, being automatically recorded, will require no exceptional acuteness of vision and no trained habits of nautical observation in the operator who receives it. A button pressed in the flagship will initiate any and every tactical evolution in the fleet and ensure an almost automatic precision in the resulting movements of the ships. The flashing lantern will be superseded at night, flags and the semaphore by day, or employed for the most part only as auxiliaries for executive purposes and for the better discrimination of ships addressing and addressed. The hideous and often bewildering shrieks of the siren will no longer be heard in the fog and the cumbrous, dilatory and very uncertain system of gun signals will become entirely a thing of the past. As the range of transmission appears to depend on certain determinate factors—such as the height to which the transmitting and receiving wires are carried and the intensity of the vibrations excited in the former—it seems not impossible that the determination of these factors may lead hereafter to an accurate and expeditious measurement of the distance between transmitter and receiver, thus superseding the sextant in ascertaining and correcting the stations of ships in a fleet.'

"If a means of signalling over distances of about thirty miles was welcomed by the Times sixteen years ago in a leader of a column and a quarter in length, how great must be the indebtedness of the Navy to the new system when a squadron based on Malta can receive signals direct from the Admiralty by this new system and when the ordinary installation of a large ship of the fleet can send messages over a distance of 2,000 miles!

Progress in Naval Communication

"When the new means of communication was in its infancy installations were made only in battleships and large cruisers; the system was afterwards extended to small cruisers, later on to destroyers, and finally to submarines. The German under-water craft, which have played such a dramatic rôle in the present war, are provided with installations which enable them to communicate three or four times as far as could a battleship in the naval maneuvers of 1899. This contrast supplies evidence of the remarkable development which has taken place in the adaptation of wireless telegraphy to the uses of the Navy in the last sixteen years. Practically every ship in the British Navy today can dispatch and receive wireless signals, and consequently the intelligence work of the Navy has undergone a radical revolution. An admiral need never be out of touch with his vessels and he need practically never be out of touch with the Admiralty. The radius covered by his intelligence service is

governed, not by the number of links in the chain of signal vessels, but by the character of the wireless installation. Admiral Sir John Jellicoe, in command of the Grand Fleet, can remain not only in hourly touch with the Admiralty, wherever he may be in European waters, but he can receive instant reports of any movements on the part of any section of the enemy's navy from patrolling squadrons.

Modern Admiral Better Served than Nelson

"In the matter of intelligence the modern admiral is infinitely better served than was Nelson, whose continual cry was 'more frigates, more frigates.' In the year before Trafalgar the Navy possessed 244 frigates to 175 ships of the line, while in 1814—just over a hundred years ago—there were 317 scouting vessels and 240 heavier ships. A British admiral was never satisfied that he had with him sufficient frigates to watch the enemy's movements, convey information to him, and act as dispatch carriers. In the opening year of the present century, with the advent of steam and iron ships, conditions had undergone a change, but still the admirals demanded 'more cruisers, more cruisers.' In the spring of 1900—fifteen years ago—the Navy embraced 45 battleships and 126 cruisers of various types and sizes, and there were 15 large armored or protected cruisers building. At that date the other six naval Powers had 52 cruisers in hand—France, 14, Russia, Germany and the United States 9 each, Japan 8 and Italy 3. The introduction of steam and the development of the steam engine had conferred advantages on Powers, great and small, and every country was intent on constructing cruisers. Of different types there were, built and building, 314 ships which could be used in scouting duties, though some officers held that many of the larger cruisers, carrying the 9.2 in. gun might also be employed in the line.

"Wireless telegraphy has since been devoted to a state of perfection as a means of communication which fifteen years ago would have been regarded as impossible. The whole world has become a whispering gallery; yet by 'tuning' and the use of codes secrecy can be maintained, so that A and B, British ships, can talk without C, a German ship, being able, except by luck in hitting on the 'tune,' or leakage of the code employed, knowing what is the subject matter of the conversation."

Mr. Hurd's remarks on the effect which wireless telegraphy has had on the construction of cruisers are especially interesting at this time to citizens of the United States in view of the discussion regarding our naval strength. He writes in part as follows:

"What has been the effect of wireless telegraphy on cruiser construction? How many cruisers are building? No armored or large cruisers—what in the past would have been known as first-class cruisers—are under construction in any shipyard for service under any flag. The only type of vessel in hand is the small scout, except in Russia, where, for an unexplained reason, six vessels of 7,600 tons displacement are on the slips. The vessels of the scouting type which are in hand are in British or other foreign yards range in displacement from 3,500 tons, in the case of Austria-Hungary, to 5,000 tons in that of Germany, the British scouts—known as light cruisers—being of 3,800 tons.

Cruiser Construction and the Art

"The attention which individual Powers are devoting to cruiser construction will repay analysis. When the present hostilities opened no fewer than 17 very fast and useful craft resembling the Arethusa, of fame, were in course of construction for the British Navy—they were described officially as 'destroyers of destroyers,' rather than intelligence vessels, and as such they have been mainly employed during the war. Germany had in hand 6 small cruisers, Italy, 4, Austria-Hungary 3, and France, the United States and Japan none. The duties which it is intended that the eight large Russian ships shall perform in war cannot be guessed; these ships stand alone and apart. If we omit Great Britain and Germany, which were involved in a keen rivalry which was to find its culmination in the present war—we are confronted with the fact that the other six naval

Powers had in various stages of construction only 7 cruisers.

"This neglect of cruiser building coincided with the development of wireless telegraphy and the increased size of destroyers carrying wireless installations.

Long Chain of Signal Vessels Superfluous

"In neither of the countries in which the building of cruisers has been almost if not entirely, abandoned, has any official explanation been made of the change of policy which has occurred. Even in the United States, where a very complete exposure of the springs of action of the naval authorities is made from year to year before Congressional Committees, no justification has been forthcoming of this abandonment of the cruiser. Throughout the world there is a general agreement that the day of the large, costly cruiser, with a protected deck or vertical armor, is over; there is no demand by officers in the American Navy for anything between the battleship and the seagoing destroyer, or if there is, it has failed to find expression. In other countries naval opinion runs strongly in the same direction, except where trade routes have to be defended.

"What is the explanation of this trend of policy? Wireless telegraphy does not render scout ships unnecessary, it is true, but it has made superfluous the long chain of signal vessels. An observation vessel—small cruiser or even destroyer—can remain on her station and pour into the flagship, 50, 100, 200, or more miles away, a continual stream of intelligence as she obtains it. Wireless telegraphy has not eliminated the scouting ship and has not increased her radius of steaming, but it supplies a method of quick, rapid and certain communication. It does not serve as eyes to the battle fleet, but performs the same duties in a fleet that the mind performs in the body, conducting the sensations from any part of the human form to the mind with the result that it is provided with material on which to act. For instance, the eye, nose or ears give warning to the mind of an imminent danger; a wise man, in the possession of his mental powers, takes suitable action to avoid it. Similarly with wireless telegraphy, the cruiser acts as the eye of the admiral and by means of its wireless installation, and without reliance on a chain of repeating vessels, communicates at once to the 'brain of the fleet'—the staff in the battleships.

"The introduction of wireless telegraphy has consequently contributed to an economy of time, which means greater strategic efficiency, and, in so far as it has been responsible for the decreased output of cruisers, to an economy of money. In some measure it has robbed the weaker naval Power of the advantage which steam conferred on him. Steam assured certainty of movement and facilitated evasion. Wireless telegraphy in greatly assisting in scouting operations, placed in the hands of the stronger navy the ability to effect concentrations in force. . . ."

It is related of the Emden that her commander depended largely upon wireless to aid him in determining the positions of British vessels. The raider steamed here and there in search of her prey, her operators from time to time picking up messages from prospective prize craft. If a British vessel answered the calls of the Emden the raider asked for her position and, having obtained it, steamed toward the ship. This is one of the ways in which wireless was employed by the Germans during the war. The advantage of wireless to the British Navy is called attention to by Mr. Hurd in an interesting manner.

Admiral Always in Touch with Ships

"Wireless telegraphy," he declares, "has completely revolutionized the intelligence services of the Navy. An admiral need never be out of touch with the ships under his command. Success in war depends in large measure upon unity in command, and wireless telegraphy, when it has been fully developed, will contribute powerfully to this end. The Lords of the Admiralty, seated in Whitehall, will be in a position to signal to ships of war on the outermost sea stations. This facility of communication will add incalculably to the strength of the British Fleet. It will

enable concentrations of force to be made swiftly to the disadvantage of the weaker naval Power. Thus wireless telegraphy takes its place beside other scientific developments of the past few decades in assisting the supreme naval power and conferring upon it advantages altogether out of proportion to those enjoyed by the smaller nations. But for the aid which science has rendered, the British Empire today would consist of a series of isolated communities, each in danger of being surprised and isolated, as they were surprised and isolated in the past. In fact, however, the King's Dominions are being day by day brought into closer relations with each other and with the Mother Country. Wireless telegraphy is destined to become the nervous system of the British peoples; a signal of danger from any isolated community will at once result in appropriate aid being dispatched. In this way wireless telegraphy will enable the British Navy to utilize to the full the advantage of speed obtained by the use of steam.

Reinforcement to Naval Powers

"Great as are the advantages which wireless telegraphy has conferred upon the Navy, its development is not unaccompanied by some disadvantages. The distinguishing character of the Navy in the past was the initiative and resourcefulness of officers on distant stations acting on their own responsibility without reference to the Admiralty. The knowledge that, owing to the development of the new means of long-distance signalling, they possess instant means of communication with Whitehall may prove a source of weakness. Attention has already been directed to this peril both in and out of Parliament. It has been suggested that the Admiralty may be encouraged to interfere unduly with the freedom of action of officers in distant seas. On the other hand, there is a danger that officers in the outer stations, confronted with embarrassing conditions, may be tempted to evade responsibility and wait for instructions from home. Both dangers exist, but probably the latter is the greater. The Sea Lords in time of war have full reason to be conscious of the heavy responsibilities which rest upon them in the exercise of the higher command. They are hardly likely to add to those decisions and arrogate to themselves the right of decision on this or that minor point of policy. But a naval officer, realizing the consequences which will fall upon him if he commits an error, may well be tempted, if he be lacking in initiative and resourcefulness, to seek direction from home instead of acting according to his own judgment.

Wireless and An Imperial Fleet

"The Empire will not gain the full advantage of wireless telegraphy until further progress has been made in Imperial co-operation for naval defense. When the Empire obtains an Imperial Fleet, subject to the control of one authority, then the Imperial wireless service will powerfully contribute to the security of every Imperial interest, wherever it may be situated. It was suggested when wireless telegraphy was invented that it would rob the British peoples of the advantages which they had hitherto enjoyed from the possession of British owned cables. It was urged that the least wealthy naval Power would be able to take the fullest advantage of Signor Marconi's invention, and that, consequently, our sea power would be robbed to some extent of the benefits in war time which it had hitherto obtained from the control of most of the cable systems of the world. It is already apparent that this is a delusion; wireless telegraphy, owing to its length of reach and rapidity, will reinforce our sea power, because we are and must remain the supreme nation on the oceans of the world. When, by the co-operation of the Dominions, and, possibly, of India, a great Imperial naval force has been created, wireless telegraphy will confer upon the supreme authority in control the ability, independent of the cable, to concentrate the right force at the right place and at the right moment; and in this way the world-wide needs of the British Empire will be strengthened immeasurably. The wireless system is still in comparative infancy, and we cannot doubt that in the course of the next few years it will be greatly developed, and every stage of advance will mark a further strengthening of the naval chain which binds the Empire together and secures its safety under peace and war conditions."

Through the Mine Fields

A Few Observations on an Interesting but Not Exciting Trip

By S. Hopkins

ALTHOUGH my experiences must appear decidedly tame in comparison with those of other operators who have been drawn into the Western Ocean trade by the unfortunate conditions now prevailing in Europe, they were interesting to me, at least. I take it this is sufficient excuse, therefore, to outline the period in which the steamship Seguranca carried me on a cruise lasting two months.

We sailed from New York on March 15 for Rotterdam, carrying a general cargo. The trip across was uneventful, with the exception of one day when I picked up the SOS call from the Denver. We were over four hundred miles from her at the time and making very little headway against heavy seas, which precluded any possibility of our being able to render assistance.

Our first experience with war conditions occurred when we were approximately sixty miles from Bishop's Rock, one of the Scilly Islands. An English auxiliary cruiser came alongside, displaying the signal MN which, in the International Code, means "Stop immediately." This was followed with a blank shot from one of her guns and prudence decreed that we obey orders and await her further pleasure. A short conversation concerning our destination and cargo then took place; after which we were allowed to proceed on our way unmolested.

The only unusual feature of our trip through the English Channel was the entire absence of war vessels. In fact, the only battleship that we saw during the trip was an antiquated cruiser lying inside the breakwater at Dover. She assisted in maintaining a night patrol of Dover Strait. This is accomplished by eight powerful searchlights, which are kept playing over the surface of the water. Several torpedo boat destroyers, without lights, put out from Dover and inspected us, but we were allowed to continue our journey.

Our hopes had been raised by the apparent indifference of the British Admiralty to our steamer, and we were in high spirits as we passed around the bluffs at South Foreland. We had been informed, through the courtesy of the commanders of several Holland-America liners, that a pilot would be available at Deal and would conduct us as far as the Sunk lightship, in the North Sea.

Imagine our astonishment, therefore,

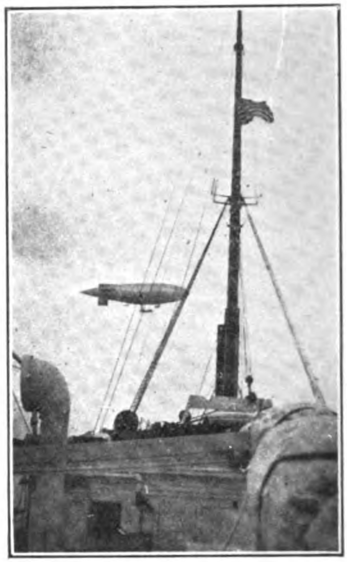
A familiar scene in Holland, the customs officers of which country immediately sealed the wireless room when the "Seguranca" arrived

on entering the Downs on March 31, when we beheld a perfect maze of lights surrounding us. At first they appeared to be stationary, and one could easily imagine oneself set down in the midst of New York. But presently our attention was attracted to a Morse light, and for the second time we were greeted with the signal MN, emphasized a moment later by the flash of a cannon from what we afterwards discovered to be a merchant vessel equipped with two four-inch cannon and one high-angle aeroplane gun. This was too pointed a request to be disregarded, and we accordingly slowed down. Shortly afterward, a tug came alongside and ordered us to anchor where we were and await daylight, when our papers would be examined. This cooled our ardor somewhat; but we anticipated nothing worse than the loss of a few hours.

It was nine o'clock before the boarding officer arrived. We had already identified four other American steamers among the sixty or seventy vessels whose anchor lights had created the impression of "The Great White Way." The official's first command was that the aerial should be lowered at once. Then, after a short pow-wow with the captain, he departed with our manifest which, he declared, would be sent to the Admiralty at London for examination.

About an hour later we were ordered to change our anchorage, and were assigned a position near the armed steamer which acted as a guard ship, preventing vessels from attempting to leave without the consent of the Admiralty.

I will not dwell on the monotony of our detention at Deal; for three weeks we remained at anchor and during that time only the captain was allowed ashore. I was appointed a committee of one to make known to the commander of the guard ship our immediate need of the services of a barber. Accordingly, I was rowed to H. M. S. Ceto and received the inspiriting assurance that he would be glad to do anything in his power to accommodate us, but was unable to countermand the orders of the Admiralty. However, the following day a barber appeared and lifted a great weight both from my mind and its domicile.



The monotony of a three weeks' detention at Deal was enlivened by the passage of a large British army dirigible

The tedium was enlivened by several incidents. At one time we witnessed the passage of a large British army dirigible, a snapshot of which is reproduced with this article. Again, one morning we all turned out to see a large French steamer come limping into port with the greater part of her poop deck blown off by a torpedo. She had managed to escape and was beached to allow cargo to be taken from her at low water.

The cannonading in northern France could be plainly heard at all times. We were not more than thirty-five miles from Dunkirk at the time the Germans besieged that city.

On April 16 a German aeroplane passed over the harbor, dropping a few bombs on the city. It was so foggy that we were unable to see the machine, but we followed the course from the hum of the propeller. The guard ship opened fire upon the German with a high-angle gun, but was unable to bring the machine down. The aviator dropped bombs on several cities about London, and succeeded in returning to Belgium safely. We read the next day that orders posted throughout the town required all lights to be extinguished at eight o'clock.

Hardly a day passed without a submarine alarm. An under-sea destroyer would be sighted in the vicinity and dozens of torpedo boat destroyers would suddenly appear and cruise about in circles. Then British submarines would appear and take part in these maneuvers.

It was April 20 when we were finally released, took a pilot and set out for Rotterdam. The pilot left us at the Sunk lightship; from there it is only ninety miles to the Maas River. We passed the North Hinder lightship (the Noord Hinder light is maintained by the Netherlands Government midway between the coasts of Holland and England) about seven in the evening, and saw there six British torpedo boats. We had previously sighted four submarines running with conning towers awash; but as they flew no flags we were unable to determine their nationality.

About eleven that night we reached the Hook of Holland; where, much to my disgust, the wireless room was sealed by the customs officer. I had to pack a suitcase hurriedly with a few necessities. After a run of fourteen miles up the Maas River, we reached Rotterdam. In all, we were thirty-seven days without touching shore.

The Seguranca lay in Rotterdam for ten days, which gave me an opportunity to visit The Hague. We made the journey in twenty-five minutes on the electric train, passing the quaint city of Delft, famous for its pottery. At The Hague we visited Carnegie's "Palace of Peace" and found it somewhat disappointing from the exterior, but wonderfully furnished inside. We also examined an old prison in which there is a collection of instruments of torture and execution used during the period when the Spanish Inquisition flourished.

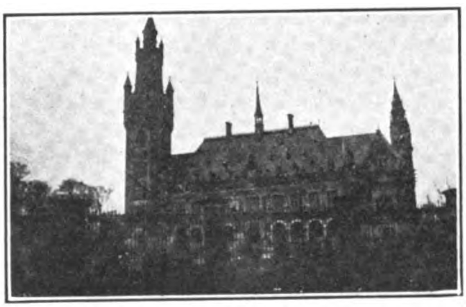
From The Hague, a run of ten minutes took us to Schevenningen, which is really made up of two separate towns; one in which the natives are composed entirely of fishermen and their families, the other of the ultra-modern type, an amusement resort somewhat like Atlantic City on a small scale. The fisher folk at Schevenningen all wear the same costume. A woman's standing in this little community is determined by the number of petticoats she wears. I have been informed that as many as twelve or thirteen of these articles are flaunted by the wealthier girls, giving them an appearance not unlike that attained by the wearers of the hoop skirt of colonial days.

It was at Rotterdam that I first saw the stork in his native haunts and was disappointed to observe that he carried no babies with him; the old legend connecting the baby with the stork, however, still flourishes in Holland.

Of the return trip there is very little to relate. We were not detained at England, although our papers were again examined by naval officers. We were not far from the Gulflight when she was torpedoed, but knew nothing of it until the next day.

The Lusitania passed us at seven o'clock on the morning of the day she was sunk.

Not an iceberg did we see, although our route took us well to the northward of the regular track. We were enveloped



Carnegie's "Palace of Peace" at The Hague was somewhat disappointing from the outside, but beautifully furnished within

in dense fog almost continuously while on the Banks and at one time we passed a berg which, though invisible, made known its proximity by echoing our whistle. Barring this and a disabled steering gear which nearly resulted in a collision with the steamer Colusa, the trip was devoid of excitement. Still, it was interesting. But, let me add in concluding, my idea of the way to enjoy your European trip is to stay at home until such time as vessels shall be permitted to go and come without interruption.

How to Conduct a Radio Club

Article XV

By E. E. Bucher

WHAT shall I do in the summer months? That is a question one often hears; and is, incidentally, one which may be answered in a most interesting way. That is, to the genuine wireless enthusiast.

The pursuit of knowledge in wireless telegraphy occupies a unique position among all the varied interests or hobbies of the young men who constitute our wireless amateurs.

The cycles of enthusiasm and dampened ardor through which many other forms of diversion regularly pass do not seem to exist; perhaps because of the variety of expression—mechanical, electrical and otherwise—to which the wireless art lends itself.

Yet in certain localities this is not strictly true. The approach of the summer season means in these communities a general exodus to the seashore or country districts, and on this account the enthusiasm of the few experimenters remaining at home wanes, and often, with local communication cut off, they conclude to temporarily abandon their experiments. Or perhaps this hasty conclusion is reached after having ascertained for themselves or learned from others that long distance work is difficult to perform during the summer months.

Then, too, the city dweller often finds it inconvenient to shift his equipment to the summer home or camp.

With due regard to the several adverse conditions, the writer knows and shall endeavor to show that this particular season is brim-full of possibilities which may result in profitable instruction and no little amusement.

Both the city dweller and the country migrator may conduct a number of interesting investigations which are impractical during the winter months, both are also afforded an excellent opportunity for correcting defects in their equipment which have become known through months of active service. That resolution, too, that the first available opportunity would be seized upon to construct a receiving or transmitting set of increased range and efficiency may now have full expression with the increased time at their disposal.

Overhauling the Station

Amateur equipments require occasional overhauling and renovation. Indeed, if the stay-at-home worker does not care to construct additional apparatus his attention might be profitably centered in this direction until every possible defect has been removed.

To properly overhaul a radio station inspection should be made of the aerial and its insulation. If the wire is badly corroded it should be replaced, and if the aerial insulators are carbonized to any extent they should be scraped and thoroughly cleaned or, if necessary, replaced.

The transmitting condenser may show signs of leakage—the lid supporting the condenser terminals may be partially burned. If this condition is found to exist, a new cover should be constructed at once. Careful examination of the tinfoil should be made and if blistering has taken place, immediate steps should be taken to correct it.

The insulation between the turns and about the support of the transmitting helix require careful survey; likewise, the "outgoing" insulators for the aerial. Correction of these defects is bound to increase the range of transmission as well as the purity of the emitted wave.

Attention should then be given to the receiving apparatus. It is well within the range of possibility that the windings of the "loose coupler" will need replacing, particularly if sliding contacts are used for variation of the inductance in place of the well-known multiple point

switch. The constant friction of the sliding contacts sometimes will have almost cut the wire in two or, on closer examination, the metal will be found to have flattened out to the extent of a short circuit between the turns. Switch contacts also require cleaning or replacing.

The telephone diaphragms may be covered with rust or perhaps "jammed" tight against the magnet. They should be carefully cleaned with a very fine piece of sand or emery paper and then given a light coat of Japan varnish. If badly bent or buckled, new diaphragms will be required. If the magnets show abnormal weakness they should be taken to the manufacturers and remagnetized.

Careful attention to these details will often result in a decided increase in the general efficiency of a radio set, amply repaying the amateur for his labor.

Advice for the Amateur Away from Home

Consider now the amateur who contemplates summering at the seashore. If he neglects to stow away his receiving equipment in some compartment of the vacation trunk, he will have passed up the realization of many hours of enjoyment at times when the ordinary routine of events palls.

An elaborate receiving aerial is not required for seashore work. In fact, at the average resort a number of ready constructed substitutes are available in the form of elevated and wholly or partially insulated conductors or capacities which are entirely suitable for receiving work. With the sensitive receiving detectors of to-day, less pretentious aerials allow the reception of signals at distances before unattainable except with the very best of antennæ equipment.

Any building with a metal roof, whether connected to earth or not, makes an aerial of considerable efficiency. If the roof is supported by wooden beams the insulation is sufficient for all possible conditions of weather and the actions taking place are similar to those in any Marconi aerial; but if the building is connected to the earth through water pipes or other metallic conductors the complete system will act as a Marconi "looped" aerial and is suitable for the reception of the shorter wave-lengths only.

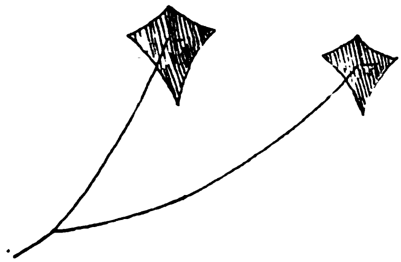
To be effective as an aerial, a wire connection should be extended from a corner of the roof to the aerial binding post of the receiving apparatus and the final earth connection made to steam, water or gas pipes.

The author has employed as a receiving aerial for a number of months the copper rain gutter of a building and secured very satisfactory results; comparable, in fact, to any amateur aerial. Signals were received at a distance of 2,800 miles with surprising clearness.

As a matter of investigation, the natural wave-length of the gutter was measured and found to be 500 meters and the capacity .0016 microfarads! This aerial system was, therefore, unsuitable for the reception of amateur signals at wave-lengths of 200 meters.

Many buildings, such as hotels or apartment houses, have metal cornices to which, if proper connection is made, signals may be received from 50 to 150 miles, and possibly further. Steel structures of any type, such as derricks, derrick tables and bridges act in a similar manner and will give satisfactory results.

Connection has even been made to the steel hand railing of a wooden bridge which was several hundred feet in length. Measurements of the natural wave-length were made and found to be 4,600 meters. Returning at a later date with a complete receiving equipment, messages were received in daylight from a high-power station 1,000 miles distant. These experiments were discontinued, however, in an abrupt manner. It seems that the gatekeeper had somewhere heard the term "electrolysis," together with mention of its destructive effects. After a few hours' deliberation, considerable apprehension arose in his mind as to the probable results of these tests; more plainly, he expected similar effects from the feeble radio telegraph current, remarking that a continuation of experiments might result in a collapse of the structure. Rather than spend the remainder of his vacation in attempting to explain the fundamentals of radiotelegraphy to the venerable gentleman and realizing the hopelessness of ultimate conviction anyhow, the writer discontinued the experiments. Some day



when this honorable post has changed hands, a return may be made and investigation pursued.

This incident merely serves to illustrate possibilities. The amateur experimenter should keep in mind, however, that the majority of the structures recommended as temporary receiving aerials generally have fundamental wave-lengths too great for the reception of signals at the shorter wave-lengths.

Amateurs in the Country

The progressive amateur is overlooking valuable opportunities if he spends his days in the country without conducting experiments with receiving apparatus. The time signals may be received twice per day from Arlington or other naval stations at 12:00 M. and 10:00 P. M. eastern standard time. Perhaps the particulor location in which he has decided to abide is, somewhat distant from the news distributing center and he may occasionally long for first-hand information concerning the activities of the outer world. With the receiving equipment at his disposal and a temporary aerial, he may listen in at specific periods to receive the press news sent out by wireless from many stations. The news may then be distributed in bulletin form to those about him. But strict attention must be given to the question of whom these dispatches are addressed to, for unless a message is intended for general use it would be considered a violation of both the United States and the International Regulations to divulge the contents of these messages to his friends.

With a number of days at his disposal the amateur may carry on some interesting experiments with aerials supported by kites.

Aerials Supported by Kites

The value of kites for making meteorological observations has been recognized for a number of years. Their employment in aerial photography and general signaling is a matter of common knowledge, but outside of a few random investigations, little has been accomplished in the field of wireless telegraphy.

Successful experiments were carried out by Marconi on the steamship Principessa Mafalda, en route to Buenos Aires, during which trip a kite supported aerial permitted the reception of signals from Clifden, Ireland, at a distance of 6,000 miles.

Similar experiments may be carried out by the amateur in the open country fields and should prove particularly interesting. On account of their unusual length kite flown aerials are more suited for reception of the longer wave-lengths; suitable receiving apparatus will therefore be described in a later paragraph.

Kite flying is a scientific procedure from which the element of uncertainty has been largely removed. The experiments of many investigators have amply proven that they may be used to lift considerable weights. They are, therefore, entirely feasible for the support of amateur aerials.

In investigating the subject of kites, the amateur will first observe that there are two principal types, namely: the tailless, flat surface or Eddy kite, and the tailless box kite. For flying in heavy winds or gales the box kite should be employed, but for the lighter winds the Eddy type is preferable. In a medium wind both types may be flown simultaneously.

The Eddy kite has shown itself the premier for stability, ease of flying and lifting ability. In fact, in the majority of kite contests for those of the single surface type it has generally wrested the laurels from all others. It is likewise noted for its simplicity of construction. Another valuable feature is its intense leaning towards vertical flying, so much so that the writer has frequently observed a team of these kites to stand in an almost vertical position over his head, then overshoot the mark, dip forward and turn a complete somersault; a feat rarely attributable to the box kite.

A well constructed box kite will raise its supporting cord to an angle of 45 or some times 50 degrees from the earth, while the Eddy type may attain an angle

of from 60 to 75 degrees. It will be left to the discretion of the reader which type he shall build, but he should be guided by the prevailing winds in his vicinity.

Before giving the constructional details of the two types, it is perhaps well to mention that the kite supported aerials should not be used during the approach or presence of thunder storms, or in regions where atmospheric electricity is especially severe. If this precaution is not observed the experimenter is apt to become an unexpected and not very comfortable participator in what might be termed Benjamin Franklin's original experiment on a considerably enlarged scale. Observe also that the experiments are carried out at a distance from trolley or high-tension lines for, should the kite line part by accident, it may drop across the wires, resulting in serious injury to the apparatus and attendants.

A suggestive sketch of a kite supported aerial has been supplied by the artist; close observation will reveal the following arrangements:

First, what is known as a team connection of kites is shown. (This is often erroneously termed a "tandem" arrangement.) Three Eddy kites, each having a vertical dimension of 9 feet, are spaced about equi-distant on the supporting cord. The rope for the first kite is payed out to that point where the kite ceases to rise vertically—it is sometimes difficult to observe when this point has been attained—but when a considerable sag is noted, a second kite of similar dimensions is raised on a piece of cord about 300 feet in length and attached to the main cord. The main cord is then payed out until a second decided sag is observed, whereupon a third kite is attached. From this point on a two-wire aerial composed of two strands of aluminum or steel wire is attached and payed out as the main cord. Attachment is then made to the wooden post in the foreground and electric connection finally made to the instrument.

The aerial wire may either have a length of from 1,000 to 2,000 feet at the least, or whatever is consistent with the lifting ability of the kite and prevailing winds, keeping in mind that this aerial is to be used for the reception of wavelengths from the high-power stations.

In the diagram, figure 3, a suggested arrangement of team kites is shown, the distance between fastenings having been indicated only after proper experiment. The cord of each individual kite is attached to the main cord by means of small iron rings. The details of a suitable knot for attaching the cord is shown in figure 4. The types of kite line indicated in the drawing, figure 3, are those furnished by the country's best known kite manufacturers, full particulars and price lists to be obtained by applying to the Marconi Publishing Corporation, New York. A sketch of a suitable reel for winding up the supporting cord is shown in figure 5, while an Eddy kite about to be raised from the earth is indicated in figure 6.

In presenting the design for the Eddy kite the writer has probably erred on the side of over dimensions, but it is obvious that the designer may carry out the experiment on a much smaller scale with satisfactory results.

A few general considerations are worthy of attention, first: The surfaces of the kites should be more or less baggy. The frame should present symmetrical construction around the principal axes. The wood for the frame is preferably of spruce, but bamboo, beech and ash are satisfactory. Even yellow pine, bass wood and white cedar are feasible, if these are the only ones obtainable.

Kite-flying cord may be purchased at

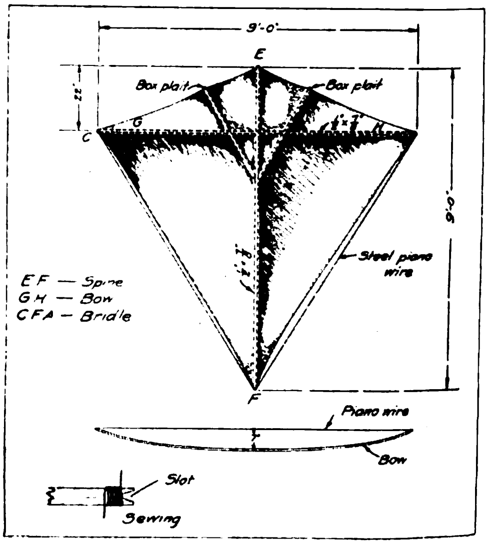


Fig. 2

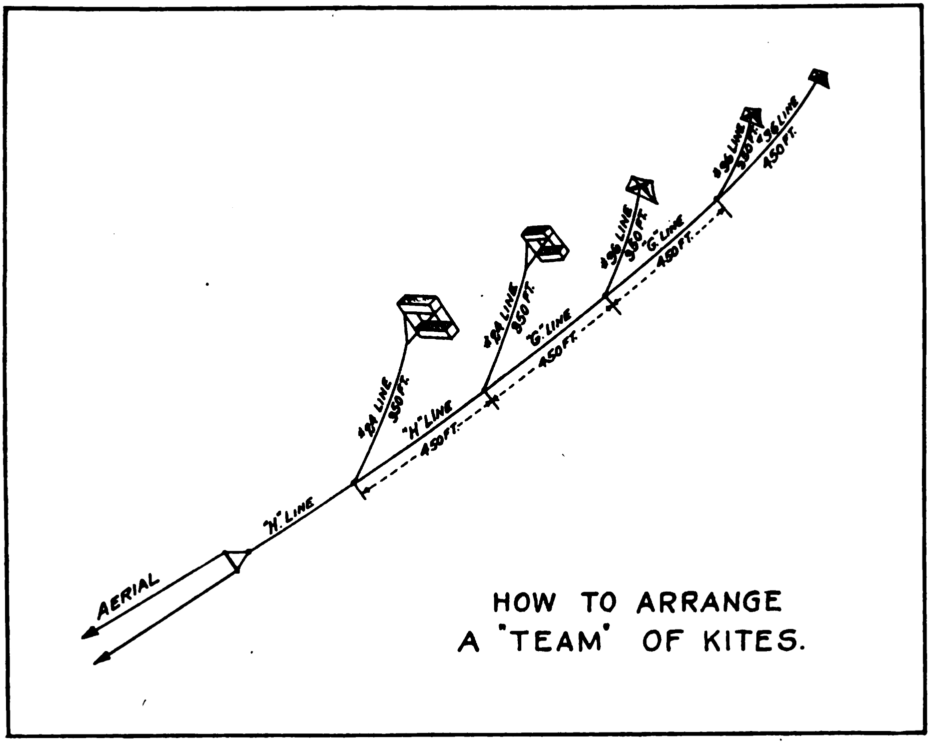


Fig. 3

many novelty stores, in fact, the entire equipment may be secured at a very nominal price. Investigation has revealed that steel piano wire is the most reliable and satisfactory of all kite supporting material. This is due to its unusual tensile strength and small wind resistance, but when several thousand feet of this wire are reeled out into space sufficient atmospheric electricity is apt to be collected to render the handling of the wire dangerous.

It should be taken into consideration that a single kite alone will rarely rise to a height of more than 2,000 feet. It may seem that greater heights are attained, but accurate measurements have proven that the appearance is deceptive, due to the kite really traveling in a horizontal position rather than in a vertical one.

Constructional Details

The simple details for construction of the Eddy tailless kite are given in the diagram, figure 2. The vertical stick EF, known as the spine, is 9 feet in length, having other dimensions of ½ inch x 1 inch. The horizontal stick, GH, known as the bow, has similar dimensions throughout. Particular care must be taken in selecting the point at which the bow is attached to the vertical spine EF. As shown at the bottom of figure 2, the horizontal stick is slightly bowed by means of a length of steel piano wire and then braced. When completed it should extend about 7 inches from a straight line, as shown.

In actual practice the horizontal stick is placed down one-fifth the distance from the top of the vertical stick, which in this case brings it 22 inches from the upper end.

The outer edge of the frame is then strung with steel piano wire, being fastened only at E. The sticks are slotted at the ends of H, F and G and then served with twine to prevent splitting, the wire being allowed to slide freely in the groove.

Before the assembling, the sticks should be accurately balanced as well as centered. The center should be measured with a rule and attempts made to balance the stick on a sharp edge. If a leaning to one end is observed, that end

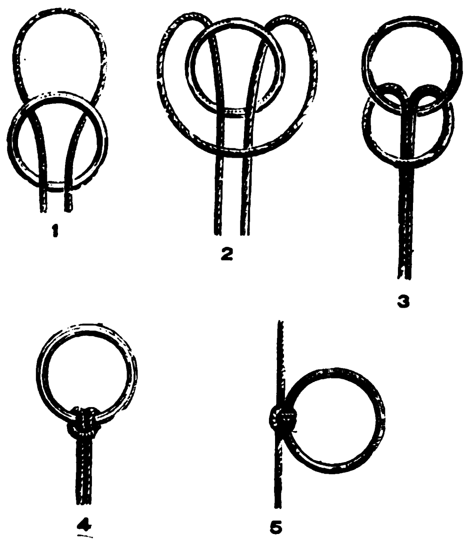


Fig. 4. How to put a ring on a kite line

should be shaved off with a knife until equilibrium is attained.

The keel for tailless kites of this type is intended to project to the front; the covering, therefore, should not be stretched tight, but put on loosely. If the covering is drawn tight the kite will dip and become erratic in action.

For the amateur who may desire to construct kites of smaller dimensions:—for a 5 foot kite the spine and bow may be 3/8 inch by 3/4 inch; for a 4 foot kite 1/4 inch by 1/2 inch, and for a 3 foot kite 5/16 inch by 3/8 inch.

Kite Coverings

Cambric is the most popular material for kite coverings. It is light in weight, may be obtained in a variety of colors and is cheap. Care should be taken not to use the goods on the bias as unequal stretching in that position will seriously disturb the stability of the kite.

An important feature of the Eddy kite is the pockets formed by the sag in the cloth as shown in the drawing, figure 2. These depressions should be of equal depth. Allowance may be made for them if the kite frame is laid on its face and the cloth cut all the way around about 1 1/2 inches larger than necessary. Thus, when the edges are sewed in a sag may be allowed as desired. The effect is considerably enhanced if a box-plait is sewn at the top of the kite as shown in the detail, figure 2.

Kite Bridles

The bridle of a tailless kite must be accurately attached either at the bottom and top of the vertical spine, or at the point where the bow and spine cross and at the bottom, (see figure 2). In any event the bridle must be so arranged that when drawn over to one side of the kite it will be just long enough to reach the outer limit of the bow. More clearly, from the diagram: FG and FC are identical in length; AG is the same length as AC. Point C should just reach G or F.

To make the kite fly high the supporting line is attached above the normal point, but if lower levels are to be maintained the rope is attached slightly below this point. A few trials will enable the experimenter to locate the proper position.

The Construction of a Box Kite

The constructional details of a healthy box kite of the rectangular type, having over-all dimensions of 9 feet are given in figure 7. The corner pieces are of spruce or other suitable wood cut 3/4 inch by 3/4 inch by 9 feet.

The central sticks or spines have dimensions 1 inch by 1 inch by 9 feet.

The cross braces are also 3/4 by 3/4 inch by 9 feet and 3/4 by 3/4 inch by 4 feet.

The upper and lower cloth coverings are 2 feet 6 inches in width, the open or intervening space being about 4 feet.

The sticks are held together by special tin fasteners which may be purchased at any novelty store. They are further braced by steel piano wire which, if desired, may be fitted with miniature turn

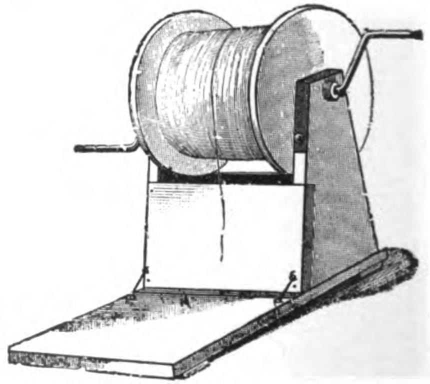


Fig. 5. Kite reel

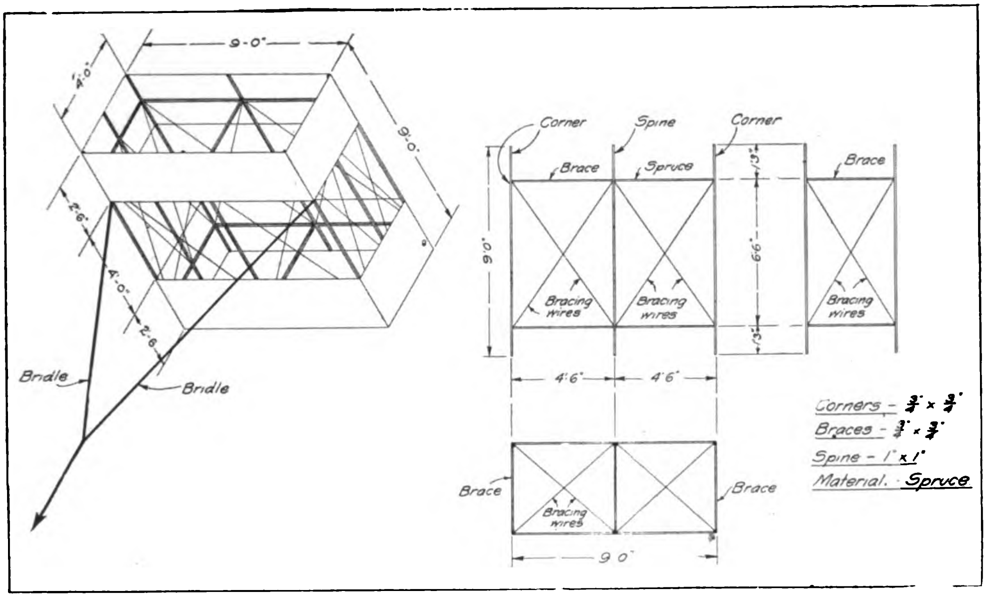


Fig. 7

buckles to take up the slack and warp.

The bridle for this kite is attached to the corner posts as shown in figure 7, but several trials must be made to locate the final position. The two sides of the bridle should join at a distance of about 9 feet from the corner pieces.

As in the construction of Eddy kites, the covering of this kite may be of cambric, carefully hemmed in at the edges to prevent tearing.

When to Fly Kites

To enable the experimenter to determine suitable winds for the two types of kites, E. I. Horstmann & Co. have prepared the interesting flag reference code shown in figure 8.

When the wind is so light that a flag flies, as shown in position 2, and every now and then drops down as shown in position 1, there is not enough wind to fly kites.

When the wind is strong enough to hold out a flag as in positions 3 and 4, the Eddy kite flies to perfection.

When the wind will hold flags out straight as in position 5, it is too strong for an Eddy kite, but is a perfect wind for a box kite; in such a wind a box kite

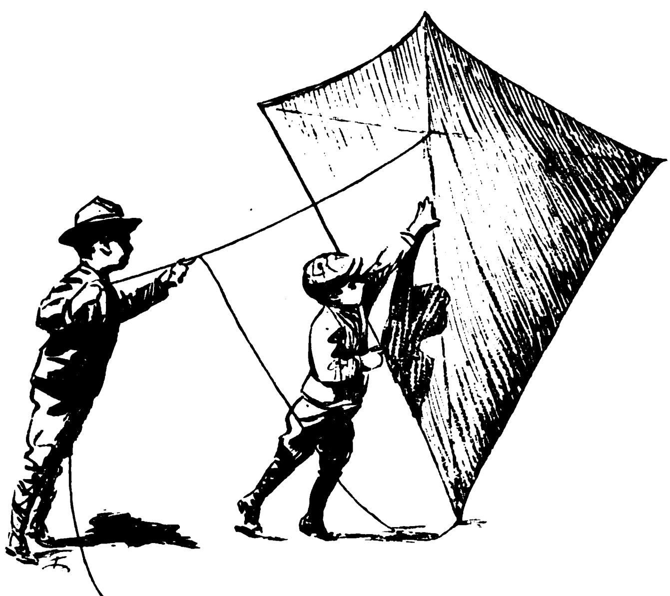


Fig. 6. Starting the flight of an Eddy kite

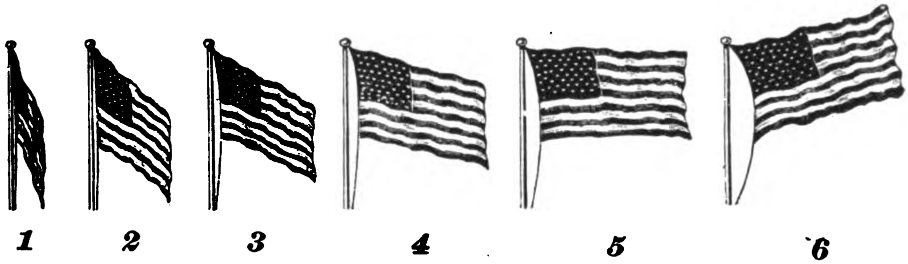


Fig. 8. Graphic chart showing various wind conditions

has great lifting power. A box kite may also be flown in a wind which will hold out a flag steady, as shown in position 4, or in such a wind both kites may be flown together in tandem.

Position 6 shows how a flag flies in a gale, the wind blowing from 40 to 50 miles per hour. In such wind neither of the kites can be flown.

A Long Distance Receiving Set

Having progressed thus far with suggestions for various types of receiving aerials suitable for long distance radio communication, interest may next be engaged in the design of a receiving tuner which will permit the reception of longer wave-lengths.

The dimensions for an inductively coupled receiving transformer which would allow the reception of signals up to and including 8,500 meters follow. A diagram of connections is given in figure 10.

The secondary winding is made on a cardboard or hard rubber tube, 6½ inches in diameter by 7½ or 8 inches in length, and is wound closely with No. 30 S. S. C. wire; the complete turns being equally divided between the points of an 8-point multiple switch. The secondary variable condenser C-2 has a maximum capacity value of .001 mfds., while the fixed condenser C-3 has a value of .003 mfds. A potentiometer P, having a resistance value of 400 ohms, is connected in shunt to a 3-volt battery B. A fixed resistance of 1,800 ohms is included in series with the battery B, in order that the voltage may be sufficiently reduced in value for sensitive adjustment of the perikon and silicon detectors. The telephones PH should have a resistance value of from 2,000 to 2,500 ohms.

It is difficult to give the exact dimensions for the primary winding of this transformer, unless the wave-length, inductance and capacity of the receiving aerial is accurately known; but for a preliminary determination the following dimensions are suggested:

The tube for the primary winding should be of just the correct size to slide inside the secondary winding previously described, namely, about 6 inches in diameter. To have sufficient turns for the various lengths of antenna which might be employed, it may be 7½ or 8 inches in length and wound closely with No. 24 S. S. C. wire.

The inductance value of this coil may be varied either by means of a multiple point switch or by the well-known sliding contacts. It may be possible that certain kite-supported aerials will have a fundamental wave-length of such value that the condenser C-1 must be connected in series with the aerial system to estab-

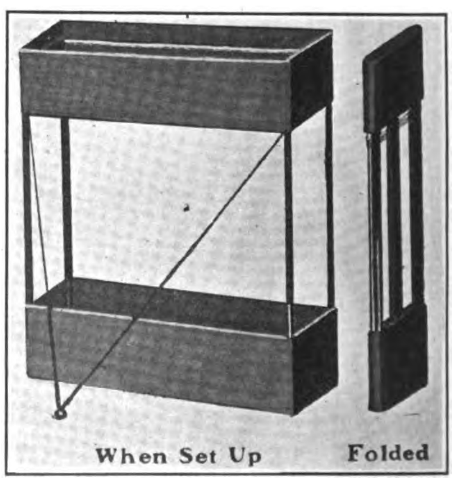


Fig. 9. Folding box kite

lish resonance.

For open field work a receiving set of this type may be constructed in a crude manner, for inasmuch as the experiments are to be of a temporary nature, expensive apparatus is unwarranted. For example: The primary and secondary windings may be made on a cardboard tube, while the inductance switches may be of the ordinary battery type, with wooden base.

Both the primary and secondary circuits must be accurately adjusted to resonance; the work would, of course, be facilitated if a thoroughly accurate wavemeter of suitable range is available. A wavemeter of this character is generally out of the reach of the average amateur.

A buzzer testing set should be included in this equipment, in order that a sensitive spot on the crystal may be readily located.

A Supersensitive Receiving Set

A contributor to THE WIRELESS AGE has supplied the diagram of connections given in figure 11, for a sensitive receiving set with which he states he has been enabled in daylight to copy signals from high power stations over a distance of 3,000 miles. He further states that it is equally suitable for the reception of damped or undamped oscillations. For this set an aerial of at least 800 feet in length is required.

Referring to the diagram, the receiving aerial A is connected to the earth through two tuning coils, T and T-1. A condenser C-1, which ordinarily is used at very small values of capacity, is connected in series with T-1. A connection is then extended from the slider S-3 through a small variable condenser C-2 to the grid of the oscillation valve G. The second lead from the condenser C-1 is extended to one leg of the filament F. B-1 is a battery of about 4 volts. while B-2 may include values up to 60 volts.

The variable condenser C-3 has capacity of .005 mfds. and is connected in shunt to the battery B-2 and the head telephones PH.

L-1 is an inductance coil, 5 inches in diameter by 26 inches in length, wound closely with No. 28 wire and furnished with a multiple point switch having 5

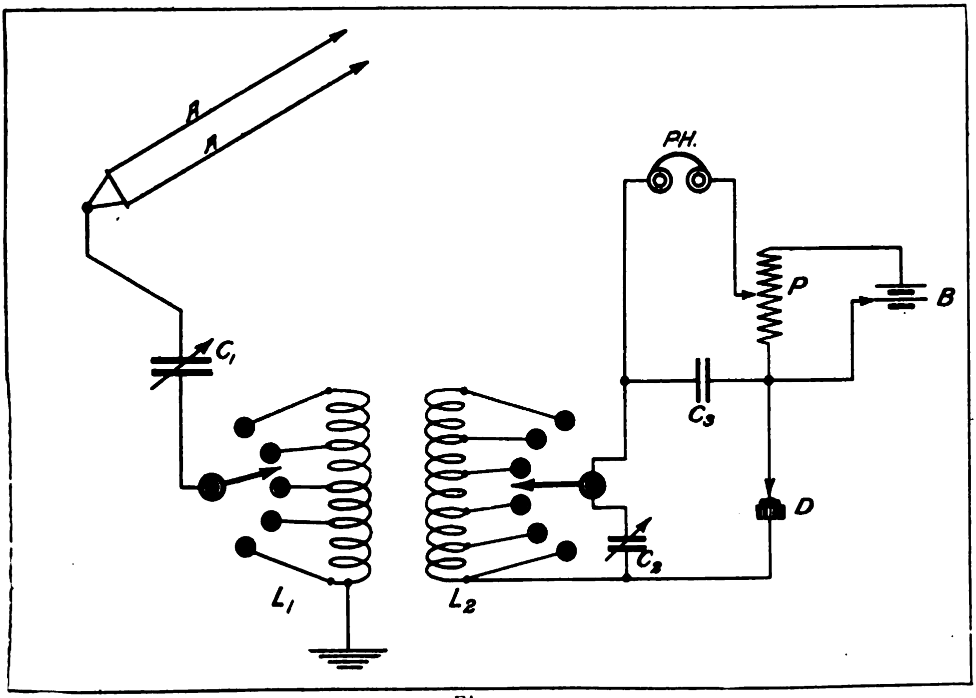


Fig. 10

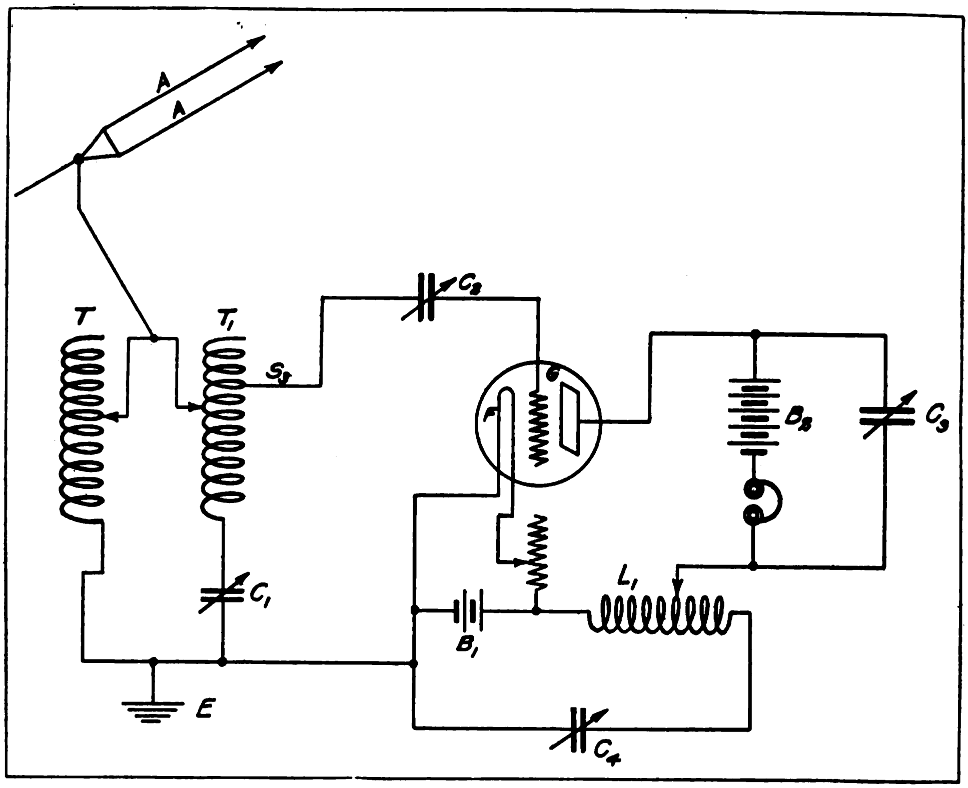


Fig. 11

taps. C-4 is a second variable condenser of .005 mfds. capacity.

The dimensions of the coils T and T-1 will naturally vary with the size of the aerial and therefore specific dimensions cannot be supplied, but for preliminary experiment they may be 12 inches in length by 4½ inches is diameter, wound closely with No. 24 S. S. C. wire.

For the maximum intensity of signals adjustments are first made at the coils T and T-1; corresponding variations being effected at the variable condenser C-1. Proper adjustment of the variable condenser C-3 and the inductance coil L-1 will result in an enormous amplification of the intercepted signals. Rough adjustments may be made at the condenser C-4. When undamped oscillations are received, variations of the values of L-1 and C-3 will give a corresponding change in the note produced in the head telephone, which of course, may remain at the particular audio frequency desired. The "blue glow" sometimes observed in the bulb is absent at the point of best adjustment. It should be understood that the set just described is more suitable for the reception of wave-lengths between 5,000 and 9,000 meters.

Aerials

Certain amateurs have put forth the suggestion that kite-supported aerials will not give the last degree of efficiency on account of the inclination of the wire and believe that better results will be obtained if the aerial wire is held in a strictly vertical position. This assumption is not correct, as the radiation from even a vertical aerial becomes more or less inclined in transit, depending upon the nature of the soil over which the "feet" of the wave pass. Thus, if radiation takes place over dry soil the top of the wave front will travel faster than the foot, and in consequence the wave is bent forward. Therefore, a receiving aerial having a certain portion in the form of a flat top will absorb more energy than a strictly vertical conductor.

(To be continued)

MEDICAL AID FROM TAMPA BY WIRELESS

The latest experiment in one of the modern uses of wireless at sea, proved a success when a Tampa doctor diagnosed the sickness of a sailor on board the tug Security.

The sailor complained of a pain in his left arm after the Security had cleared New Orleans for Wilmington, N. C., and the captain prescribed a dose of salts, the deep sea cure for all ailments.

A few days later the arm began to swell, and a high fever developed. The first-aid-to-the-injured book was brought into action, and its pages eagerly scanned to find the safe and certain cure for swelling arms and fever. Rules and regulations for treating fever were carefully followed, and were partly successful. But nothing was found that pertained to swellings of arms that had been neither cut nor bruised. Many were the applications applied to the injured limb, together with an occasional dose of salts to keep the circuit in good working condition. But, as the classics say, "there was nothing doing."

After transferring barges with the Astral at sea, off the coast of Florida, the Security headed for New Orleans, the captain doing his level best to relieve the pain of the sailor. On the fifth day at sea, the swelling increased and high fever developed. Recondite and plentiful was the medical advice given by different members of the crew, everything from "pow-wows" to making incisions being suggested; but the rules and regulations for making incisions could not be found in the first-aid book, and it was deemed unwise for one not experienced in the art of incisioning to attempt it.

As a last recort Wireless Operator George H. Reachard suggested sending a wireless message ashore for a diagnosis of the case, and a prescription from a doctor to relieve the pain until the Security reached New Orleans. Up to this time it was not known what kind of sickness the patient had contracted, therefore the only thing to do was to change the treatments from time to time, and see which had the desired effect.

Between the captain, chief engineer, and the Marconi operator the following message was composed and transmitted to the Tampa wireless station:

TO MANAGER,
TAMPA:

PLEASE CONSULT PHYSICIAN AS TO BEST COURSE TO PURSUE REGARDING SICK SAILOR, LEFT ARM STARTED SWELLING SIX DAYS AGO AT ELBOW BEGINNING WITH TWO LUMPS. SWELLING PROCEEDED FROM THERE TO HAND. IS NOW SWELLING TOWARD SHOULDER. HAD A HIGH FEVER AT BEGINNING, BUT FEVER HAS ABATED. AT TIMES HIS MIND WANDERS. COLOR OF ARM DARK RED. HAS NOT SLEPT FOR SIX DAYS. MEDICAL STORES LIMITED. ADVISE AS TO BEST HOME REMEDY.

In the meantime the patient was suffering terribly, and the case took on a grave aspect. The reply to the message was anxiously awaited.

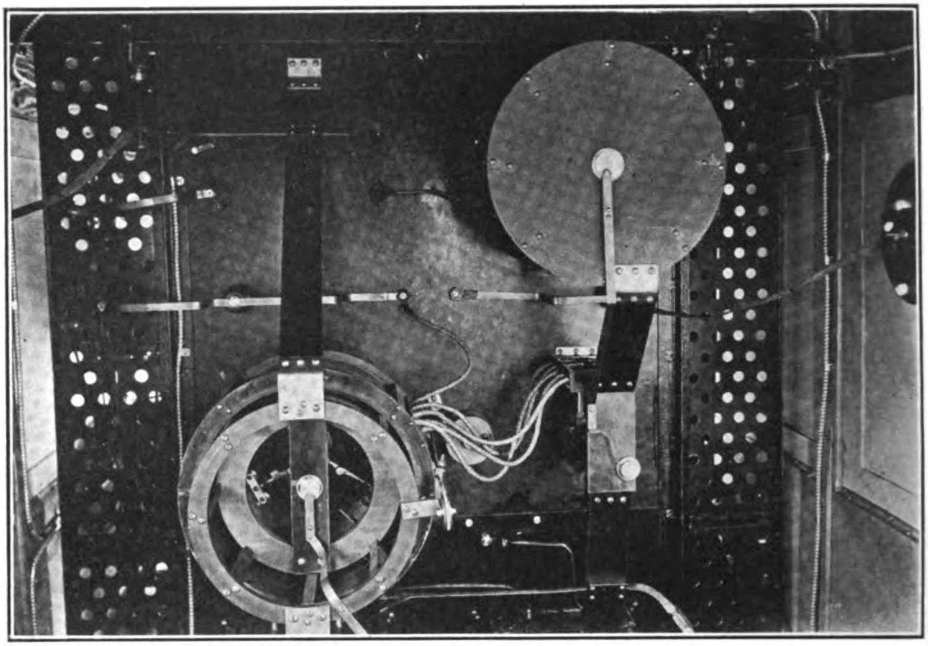
A few minutes later the following message was received:

DOCTOR SAYS: MAKE SATURATED SOLUTION BORIC ACID IN WATER. WRAP ARM FROM SHOULDER TO HAND. KEEP IT SOAKED IN HOT SOLUTION. KEEP BOWELS OPEN. GET MAN ASHORE QUICK AS POSSIBLE. IS BLOOD POISON. IF BORIC ACID NOT OBTAINABLE MAKE SOLUTION ONE TO FIVE THOUSANDTH BICHLORIDE MERCURY IN WATER.

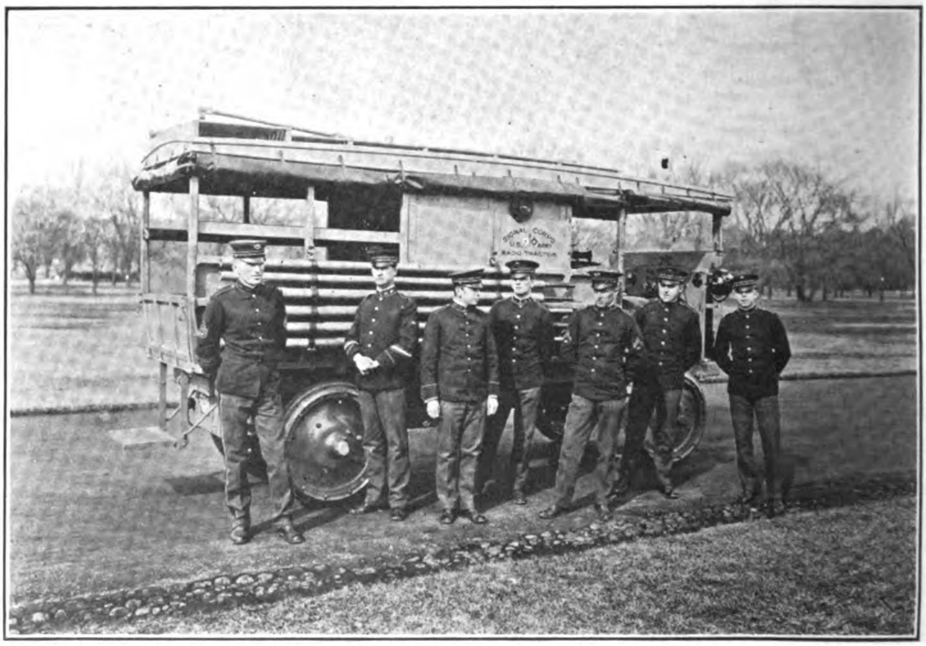
It was seen then that the sailor's life was in grave danger. The medicine chest was again explored to find the ingredients prescribed by the doctor; these were not available.

A course was immediately laid for Tampa, the nearest port, 180 miles nor'-east. Arrangements were made via wireless to have a tug boat meet the Security at Egmont Key and convey the patient to the hospital. Reports via Tampa wireless station kept the Security posted as to the condition of the sailor. The first report was "chances for recovery about even," and the last "patient slightly improved." Once ashore the patient received prompt attention and is now on the road to recovery.

The captain and entire crew of the Security extended their most sincere thanks to Manager Young, of the Tampa Marconi station for his efficient services in handling his end of the circuit.



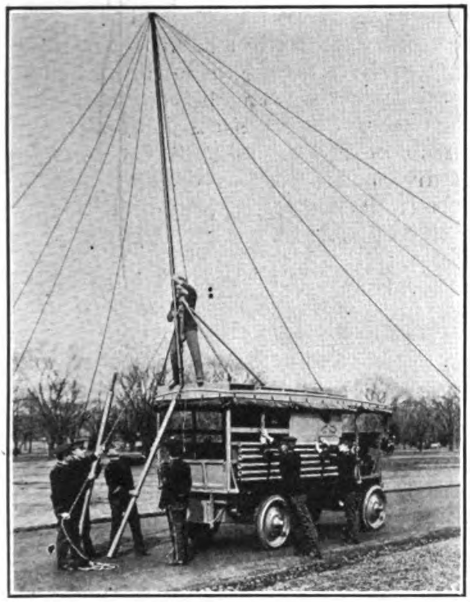
Interior view of "Radio Tractor No. 2," showing oscillation transformer and aerial tuning inductance. The complete set loaded weighs about 5,000 pounds



The army's new wireless equipped tractor which, driving by all four wheels, can be guided across country if necessary, carrying its crew of two chauffeurs, two operators, two messengers and one non-commissioned officer in charge

ARMY'S NEW SIGNALING TRACTOR

A PORTABLE wireless station, mounted on a three-quarter ton truck, has just undergone some successful experiments at Fort Myer under the direction of the Army Signal Corps. The new equipment has been called "Radio Tractor No. 2" and in many particulars is similar to "Radio Tractor No. 1," which was described in detail in the



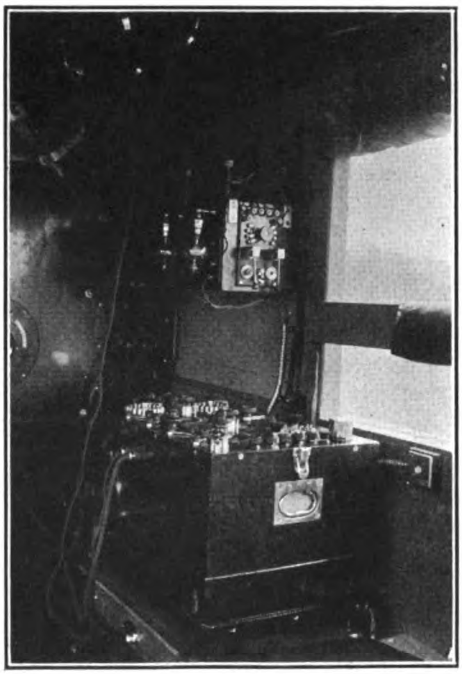
Erecting the 60-foot mast by means of mast hoisting shears which fold down close to the roof during transportation. With the crew shown the equipment can be put in working order in about five minutes

February issue of THE WIRELESS AGE.

Unlike its predecessor, however, No. 2 can travel across country, if necessary, quite as well as on highways.

The chassis is of the Jeffery commercial type, but carries a specially designed body. Electrical equipment installed consists of a 1 k.w. alternating dynamo of the high frequency type, which by means of a special lever can be thrown into gear with the automobile engine. A portable switchboard is installed back of the driver's seat, on which are placed the various apparatus required in regulating and controlling the wireless operation. On the top of the body is a mast hoisting shears which fold down close to the roof during transportation. An electric signaling lamp is carried on top and is used as a searchlight or for auxiliary communication by the wigwag method.

The complete set loaded weighs about 5,000 pounds, or practically the same weight as that of a loaded escort wagon. It is light enough to follow the divisional headquarters under ordinary conditions and for that reason is designed to take its place in the signal corps divisional organization. The crew consists of two chauffeurs, two radio operators, two messengers, and one non-commissioned officer in charge. This crew is sufficient



The receiving tuner and one-step amplifier seen from the interior of the army's latest portable wireless station

to put up the 60-foot mast supporting the antenna of the umbrella type in about five minutes.

It is stated that the guaranteed range of this equipment is 100 miles, although under favorable conditions the set is expected to operate a distance of more than 150 miles.

With the Amateurs

During the recent visit of the Atlantic Squadron in New York a temporary radio station was maintained at the Hotel Ansonia, the headquarters of Admiral Fletcher and many of his officers, for their use in communicating with the vessels of the fleet. The station was established in the United States Navy League rooms, the Radio Club of America making the installation and carrying on the operation.

The equipment was of composite non-synchronous 1 k.w. type, power being supplied from a special motor-driven alternator. The station was operated under a special temporary license and was tuned to an unusual degree of sharpness, the decrement being .05. Paul F. Godley, one of the Club directors, made the installation and two operators were in constant attendance, Mr. Godley and Messrs. Sadenwater, Lemmon, Grinan and Faraon handling most of the work. All communication was with the vessels of the fleet.

Regulating the clocks of the South Side High School in Newark, N. J., was the first activity which followed the recent organization of a radio club for students of that institution. On an aerial 145 feet in length and 100 feet high the weather reports and the noon time signals are now regularly caught and recorded under the direction of Instructor Hunkins, in charge of science instruction in the school. The most recent addition to the club's equipment is a buzzer practice set, built from the description given in a recent number of THE WIRELESS AGE.

The secretary of the Connecticut Valley Radio Club, George E. Beecher, Jr., of Springfield, Mass., announces that the club membership has reached thirty, a considerable gain over the membership of eight with which the club began. An invitation is extended to all amateurs to call IZL, the station of Dean A. Lewis, vice-president and holder of a special license.

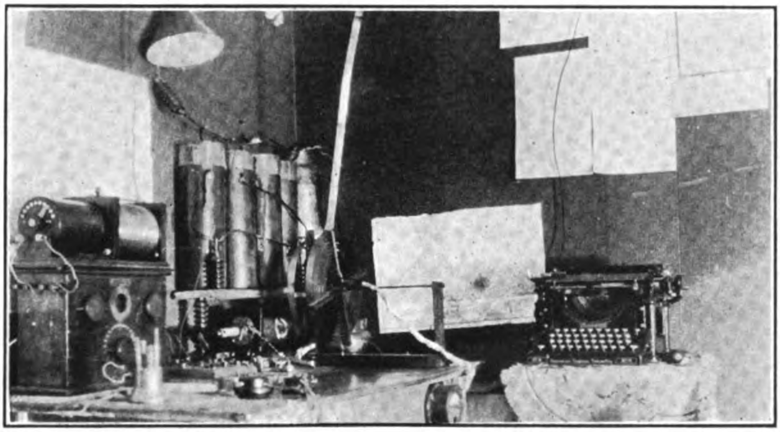
July 9 is the date set aside as the third anniversary of the organization of the Colorado Wireless Association, of Denver, Colo., which now has over eighty members and makes its headquarters in the Y. M. C. A. Building. During the summer season the sending of "time" each night at 10 o'clock by Chief Operator W. H. Smith will be discontinued, but will be resumed again in the fall and carried on throughout three seasons of the year. Special distinction, so the members believe, should be conferred upon this club for having one of the best aerials in the state, four-wire and 400 feet long, suspended at a height of 150 feet.

Organized for the purpose of co-operative instruction of members who wish to become commercial operators, the Los Angeles Radio Association reports a total of seventy members at the expiration of its seventh month of existence. Meetings are held one night each week in the Science Building of the Los Angeles High School.

The Cape May County Radio Association, of Wildwood, N. J., is a newcomer in the amateur field. Lawrence Chalmers is president and Edward Schlichting, secretary.

Clifford P. Morrison, of Yonkers, N. Y., is the owner of station 2LN, a familiar call to amateurs in the neighborhood. His equipment comprises an aerial composed of five wires, seven strand phosphor bronze, each wire insulated with high tension electrose ball insulators, and two 10 inch insulators in series on each rope; and is about 60 feet high.

For transmission 1 k.w. Clapp Eastham, type E, transformer is used, secondary voltage 12,000. This transformer is immersed in tank of oil and is seen between the two tables. The leyden jars



The efficient amateur station of Clifford P. Morrison

are copper plated, gallon size, and stand on frame, which is mounted on long electrose insulators, connections of heavy copper cable braid.

Oscillation transformer is made of one inch brass ribbon wound 8 turns in secondary and 1 turn in primary, with about four inch coupling. Large muffled spark gap is seen in the photograph directly under the leyden jars.

At a recent meeting of the Fulton Carlyle Radio Club of Cleveland, Ohio, R. P. Irvine was elected president; Myron R. Pesek, vice-president; Stanley Charek, secretary, and Stanley Green, treasurer. The club is constructing a one kilowatt station for working with distant amateur organizations.

At a meeting held April 20 in Binghamton, N. Y., "The Binghamton Progressive Radio Association" was formed. Officers elected for the first term were: President, Kenneth Kingsbury; vice-president, Wallace Dunmore; secretary, Ray H. Holmes; treasurer, Mr. Bovee. An experimental department is to be established and instructive discussions will be held.

Norfolk (Va.) has two squads of juvenile wireless operators who have acquired a degree of proficiency that is very encouraging. Four of the youths are licensed and five are not. Most of them have their own sending and receiving sets. Edward Sampson, one of the licensed operators has received messages from Pensacola, Fla., and Arlington.

The licensed operators are: George Boughman, Albert Le Faucheur, and Jack Walthall, York street.

A new organization, the Radio Club, has been formed at the Boys' Branch of the Bedford Y. M. C. A., 420 Gates avenue, Brooklyn, N. Y., by John H. Diemer, boys' dicertor.

"The purpose of the club," said Mr. Diemer, "is to get the boys of the Bedford district interested in wireless telegraphy. There are many youngsters who would like to study wireless, but have not the appliances. We have installed a complete set of instruments."

The officers of the Radio Club are: Harold E. Perry, president; Samuel Hammond, vice-president, and J. Kenneth Mitchell, secretary. The charter members include E. Carlson, Samuel T. Hammond, Clifford H. Bowie, Harold Perry, John Wilson, George J. Knight, J. K. Mitchell, E. Perry, Harold Hamlin, Charles Rupprecht, Lewis Dorsch, Robert Dorsch, Earle Morris and Kenneth Lane.

Thirteen new members were initiated at a meeting of the Connecticut Valley Radio Club held in Springfield, Mass., recently. The club is conducting a membership campaign, under the direction of George W. Beecher, its secretary.

The Year Book for 1915

DOES an article on "The Influence of Wireless Telegraphy on Modern Strategy" written by an expert appeal to you? Are you interested in the progress of wireless telephony? Do you feel that you ought to have a thorough knowledge of the International Radio Telegraphic Convention? Would lists of the wireless telegraph stations of the world with their call letters be of value to you? Are you interested in the proceeding of the London International Conference on Safety of Life at Sea? These subjects and a host of others are exhaustively treated in "The Year Book of Wireless Telegraphy and Telephony" for 1915, published by the Marconi Publishing Corporation, 450 Fourth avenue, New York.

This volume should have a place on the book shelf of every person interested in wireless. The information which it contains has been carefully selected with the aim of placing within reach of the reader all that is essential pertaining to the subject. A glance over the pages of the book will show that the ambitions of its editor have been realized, for it fairly bristles with facts and figures pertinent to the art.

"The Record of the Development of Wireless Telegraphy," which fills eighteen pages, covers a period extending from 1831, when Michael Faraday made his discovery of electro-magnetic induction between two entirely separate circuits, to the present time.

"The record of progress and development in wireless telegraphy and telephony for 1914 stops abruptly with the outbreak of the European conflict," says the concluding paragraph of this feature. "This was only to be expected, for in both neutral and belligerent countries research work on a large scale has been postponed and international cooperation in scientific investigation is almost at a standstill. The war service work now engages the whole of the attention of those who in peace time would be engaged in progressive work, both scientific and commercial. It is common knowledge that extensive use is being made of wireless telegraphy in the present struggle and no doubt such wide practical application of the new science under the most varied conditions will result in the collection of a great volume of data leading up to important progress after the close of the mighty conflict, when opportunities will again be afforded for peaceful pursuits and scientific research."

The experiments in wireless telephony made by Mr. Marconi in March, 1914, when he joined one of the Italian war vessels attached to the squadron commanded by the Duke of the Abruzzi are referred to as follows:

"Experiments in wireless telephony were carried out between several vessels lying at anchor one kilometer apart, ordinary receivers being used with great success. At night wireless telegraphic signals were received from Glace Bay, Canada, over a distance of 6,500 km. (4,062 miles).

"The wireless telephone experiments were continued between two warships on the high seas, and the reception was consistently perfect over a distance of 30 km. On the fourth and last days successful wireless telephone experiments were carried out, communications being effected using only very limited energy between vessels on the high seas 70 km. (45 miles) apart. These experiments were repeated between two vessels situated at a distance of about 20 km. (16 miles), where land interfered between the communicating vessels, and in this case again excellent results were obtained. On this day radio-telephonic communication was constantly maintained for twelve hours, and the continuous working of the apparatus did not cause the slightest inconvenience."

The laws and regulating of wireless are fully set forth in the articles of the International Radiotelegraphic Convention. An appendix containing abbreviations follows them.

In connection with the list of wireless stations published it is announced that, "The tables of land and ship stations should be consulted in connection with the map of wireless telegraph stations of the world inserted at the end of this book. The stations have been grouped together under the names of the countries in which they are established, and these countries have been arranged in alphabetical order, therefore no difficulty is likely to be experienced in locating any particular station.

"The call letters of every station are given. Recently, however, the International Bureau has alloted a revised list of combinations and call letters to signatories of the Convention, and on page 517 is published a list showing the call letters which have been reserved for the exclusive use of the respective countries.

"An alphabetical list appears on pages 518 to 559 which contains call letters for all stations (land and ship) together with the number of the page whereon particulars of each station are to be obtained.

"Stations which are of a private or experimental character do not figure in the lists, except where the information available has been such as to justify their inclusion."

Trans-oceanic communication in connection with the European war is touched upon in an article entitled, "Long Distance Services."

"To those of us who can realize the fact that radiotelegraphy is yet in its infancy the present situation is full of significance," declares the article. "The Austro-German Allies, but for the fact that they possess certain high power long distance wireless stations, would be entirely cut off from the rest of the world. This means that the two central European Powers would be unable to send out orders or give or receive intelligence of any kind whatever, except through neutral countries whose cable communication is almost entirely under British control. Germany has always been conscious of her disability in this respect and for many years past has spent her money lavishly in laying German cables—only to see them cut by the British within forty-eight hours of the declaration of war.

"After the cutting of the cables the German long distance wireless stations abroad were able to maintain service which was found particularly useful by their rulers in the Fatherland. The next move in the British assault upon German communications consisted in the destruction, one by one, of many of their high power wireless stations. The detrimental effect upon Germany of the British successes in this respect cannot be better demonstrated than by the following extract from an official communiqué issued at the beginning of 1915 by the German Colonial Office. It reads as follows:

" 'Soon after the outbreak of war all communication by the Colonies by sea was broken, and all German submarine cables were cut by the British, so that even telegraphic communication with the whole of our colonies was rendered impossible. The only remaining means of communication was wireless telegraphy, but the first warlike measures of the British were directed to depriving us of this means also. On August 12th fell the wireless station Yap, and soon afterward the station Naru (both in the Pacific Ocean). Tasigata (Samoa) fell on August 29th, and Bitapaka, in New Pomerania, on September 12th. During the night of August 24th the great station at Kamina, in Togoland, had to be destroyed by us in order to prevent its capture.

" 'So vanished all possibility of further direct communication with the African protectorates, which hitherto had been able to communicate via Kamina. As a matter of fact, there had been from the very beginning a disturbance of the system, which prevented us from receiving any reports from the governor of East Africa after the outbreak of war. And so the material which we have collected and which in the main reached Berlin by circuitous routes and very late, is mostly derived from private letters or from enemy newspapers and must necessarily remain fragmentary and some of it must be regarded as untrustworthy.'

"At present the high power stations in Germany cannot be got by the Allied

forces, and these now form the sole direct link between the Austro-German authorities and the world outside their immediate neighborhood. . . .

"So much for the lesson of the utility of Government wireless stations in the hour of national need as exemplified. . . . Is it too much to hope that, now long-distance wireless is daily proving its powers in warfare, the re-establishment of peace will bring once more to the fore the final consummation of the Imperial wireless chain which was occupying so much attention before the war started?"

"The Function of the Earth in Radiotelegraphy," by Dr. J. A. Fleming; "International Radiotelegraphic Research During 1914," by Dr. W. H. Eccles; "Wireless and War at Sea," by Archibald Hurd; "The Influence of Wireless Telegraphy on Modern Strategy," by Colonel F. N. Maude; "Some Applications of Radiotelegraphy," by A. H. Morse; "The Application of Wireless Telegraphy to Meteorology," by R. G. K. Lempfert, and "Wireless Telegraphy in Survey," by A. R. Hinks, F. R. S., are other attractive features of the book. Thirty-two illustrations add variety to the pages. The book, handsomely bound in buckram, contains about forty pages more than the volume issued for 1914. The price is $1.50.

BOOK REVIEWS

HOW TO MAKE A TRANSFORMER FOR LOW PRESSURES.

DIRECTIONS FOR DESIGNING, MAKING AND OPERATING HIGH-PRESSURE TRANSFORMERS.

These two pamphlets have been written in easily understandable English by Prof. F. E. Austin, of the Thayer School of Engineering, Dartmouth College. The first deals with the construction and operation of a small "step-down" transformer for experimental purposes which may be connected with any house circuit with 110 volt current or less, and 60 cycle frequency. The transformer described is rated as one of 100 watts, but actual testing of a transformer made by students under the directions proved that it would transform considerably more power without heating. The directions are unusually explicit and should be perfectly clear to the novice. Price 25 cents, from the Book Department, The Wireless Age.

The second pamphlet deals in the same comprehensive manner with a "step-up" transformer for house mains, to step-up pressure to 5,000 or 10,000 volts, or more. There are numerous illustrations of the actual apparatus used in the construction and considerable technical information of value to both novice and advanced experimenter. Price, 50 cents, from the Book Department, The Wireless Age.

THE CENTRAL RADIO ASSOCIATION BLUE BOOK. *Published by the Central Radio Association.*

The cover of the book states that it is a station call directory and ready reference book of wanted facts. The volume contains a list of stations of all of the members of the Association which cover nearly thirty states. The call letters, sending power, make of transformer or coil used, transmitting distance and other interesting data of every station are given.

In addition to the list of members, the call letters of several hundred amateurs who hold government licenses and have not yet become members of the association are given. Other information includes a full explanation of the government time signals and weather forecast code, an illustrated article on the construction and operation of the audion detector and audion amplifier, a list of all of the principal government land and naval stations and their call letters, the abbreviations authorized by the International Radiotelegraphic Convention, as well as a list of the abbreviations in general use. One page has been devoted to a key to the station calls of the world, enabling operators to locate the origin of any official call.

The book will be mailed to any one upon receipt of the price, 50 cents.

The Rescue of The Lusitania's Operators

Details of the Manner in which Leith and McCormick Escaped Death. Other War Incidents

ADDITIONAL details of the destruction of the Lusitania by a German submarine show that Robert Leith, the senior operator on the vessel, had gone to luncheon in the saloon when the ship was torpedoed, his assistant, David C. McCormick, being in the wireless cabin. When Leith sat down at the table a woman on his left remarked that he was late and would not get any luncheon. She had hardly spoken when the Lusitania was struck by the torpedo. Leith hurried to the wireless room where he found that McCormick had made preparations to send the S O S. The appeal was flashed immediately, the Marconi men remaining in the cabin to operate the set till they could be of no further aid in summoning assistance.

Leith and McCormick did not see each other from the time they left the ship till they had reached Queenstown. Leith jumped into a life-boat which had been launched, but was partly submerged. He made his way with others into another boat which was fastened to the derricks of the Lusitiana by ropes. These, Leith said were severed by a pocket knife in the hands of Collis, an American passenger, the action of the latter preventing the boat and its occupants from being dragged down with the steamship. Leith was picked up by the fishing smack Wanderer and taken ashore.

A dull heavy thud gave warning to McCormick that the Lusitania had been torpedoed. Following the explosion, he said, several articles about the wireless cabin came clattering to the floor. Beyond the period when the Lusitania had listed so that members of the ship's company were able to walk down her starboard side into the water, McCormick's recollections of what occurred are not clear. He recalls, however, clinging to a collapsible boat after he had successfully fought against being carried under the waters by the suction due to the sinking of the Lusitania. He was rescued by a torpedo boat.

Leith is about thirty years old. He has been detailed on various vessels, including the Aquitania, Oceanic, Celtic, Caronia, Franconia, Adriatic and Baltic. He was at one time employed as a telegrapher on the London and Northwestern Railway.

McCormick's home is in Glasgow. Before he entered the Marconi service he was employed in an attorney's office. He is twenty years old and has been detailed on the Ionian, Colonian, Landon Hall and Warwickshire.

According to London correspondents, Mrs. Inez Milholland Boissevain on June 2 gave an interview to the press in which she said the American liner St. Paul was chased as far as the Mersey River by a German submarine. She said the chase ended on the night of May 29, only when British torpedo boats came to the rescue. Mrs. Bossevain stated that the captain of the St. Paul told her and Guglielmo Marconi about the chase when they got off the St. Paul at Liverpool.

The statement disclosed that Mr. Marconi received a warning from the Italian Consul before he left New York that an attempt might be made by the Germans to stop the St. Paul and take him off. For this reason his name was kept off the passenger list and every endeavor was made to prevent the inventor's presence on the vessel from becoming known.

"Mr. Marconi removed all the labels from his luggage, gave his private papers into my care and got into clothes suitable for slipping into a hiding place somewhere down in the bowels of the ship," said Mrs. Boissevain, describing the adventure.

"That night we had a concert at which Mr. Marconi was to preside and the programmes were inadvertently printed with his name as chairman. The captain ordered all programmes destroyed, and when the concert began it was announced that Mr. Marconi was to have presided, but that he was unfortunately not aboard the vessel. And Mr. Marconi was right there at the time and every one knew it.

"We had quite a lot of children aboard—the sons and daughters of Canadian officers going over with their mothers to join the army quartered in England. We saw two trawlers and the children tried very hard to persuade Mr. Marconi to hide.

"Late in the day, before we reached the war zone, we heard of the Nebraskan's experience, and then the captain sent this wireless to Queenstown: 'In view of recent events, don't you think you had better keep your eye on us?'

"This answer came back to us: 'Full speed ahead. Alter your course as much as possible. Submarines watching bar.'"

Officials of the American line in New York stated they had received no word from their London agents regarding the reported chasing of their ship, the St. Paul, by a submarine up the Mersey River. They refused to comment on the report until they receive definite information as to the facts.

A dispatch from London says that the American cargo ship Nebraskan, owned by the American-Hawaiian Line, bound for the United States in ballast and flying the American flag, was torpedoed, in all likelihood, about fifty miles west of Fastnet on the southwest coast of Ireland on May 25. Her captain, J. S. Green, of San Francisco, in wireless reports states that he may have struck a floating mine, but naval authorities question the probability of a ship encountering a mine fifty miles from land and remote from any mine fields. The Nebraskan was not sunk.

As soon as the vessel was struck all hands were ordered to abandon the ship. Officers and crew took to the boats and pulled away, expecting that the vessel would go to the bottom in a few minutes.

When it became apparent that the Nebraskan's bulkheads were holding the crew went aboard again. An examination showed that only the lower holds had admitted water.

The Nebraskan is an oil burning steamer and her fuel supply was intact. Captain Green managed to head her around and started for the English Channel, sending out S O S signals, which brought aid.

A report issued by Admiral Thaon di Revel, chief of the Italian naval staff, shows that Austrian wireless messages are intercepted regularly by the Italians, says a special dispatch from Rome. The Italians have been enabled to obtain this information which is of immense military value, by the use of a new device invented by Guglielmo Marconi.

In a dispatch from Paris it is related that the president and members of the Russian Duma recently sent a wireless message to the French Chamber of Deputies from the new station erected in Russia expressing confidence in the victory of the Allies. President Deschanel of the Chamber of Deputies responded with a message of thanks.

Windmill-Driven Generator for Aero Sets

Photograph showing the device in operation

THE novel windmill driven generator for aeroplane wireless service developed by L. J. Lesh promises to solve some of the problems in the equipment of aeroplanes with power sets. The simple expedient of belting the generator direct to the gasoline engine has long since been found impracticable for the wireless set becomes inoperative when the motive power gives out. Engine trouble or exhaustion of gasoline while the aviator is over the ocean would present a very definite need for a call for help just when the set could not be worked. Thus far storage batteries have been found too heavy for satisfaction to the fliers so the windmill generator should prove extremely useful.

Taking into account that the aviator must always maintain considerable forward velocity, Mr. Lesh turned naturally to securing power from the speed of the aeroplane and made his first windmill experiments with an automobile. The fan was belted to the generator, a 500-cycle machine with direct connected exciter. At a speed of 50 miles per hour the fan rotated at 1,000 r. p. m., and the generator at 4,000 r. p. m. Ammeter, voltmeter and tachometer were arranged so as to give complete data on the tests. Readings were taken at speeds from 30 to 65 miles per hour and the results were very interesting.

It was learned that power developed increased with the speed but reached a maximum limit at about 60 miles an hour. Just what happens then has been a question, but it was definitely established that between the speeds of 55 and 65 miles per hour there is a comparatively small variation of power developed. A like phenomenon was observed in experiments with propellers at high speeds. The blades get in each other's way and fail to take a proper grip on the air.

The generator developed a full ¾ kilowatt at 60 miles per hour, although designed for but ¼ kilowatt. Excellent cooling made it possible to work with considerable overload. The aerofan is similar in construction to a bicycle wheel, a steel rim being used with steel spokes in tension and aluminum blades annealed and creased around the spokes and ball bearings in the hub.

A wireless key was interposed in the electrical circuit and experiments were made in taking a load on and off the generator. Resistance in the form of a bank of lamps was cut in and out, as in transmitting messages, with no apparent effect on the speed of the generator These trials having proven automatic speed regulation to be inherent in the fan and that ample power was developed for wireless, the apparatus was transported from New York City to Hammondsport and installed in a regular Curtiss hydroaeroplane.

The Lesh aerofan was clamped to the frame of the machine in such a way that it could be raised and lowered to adjust the belt passing through aluminum tubes to the generator situated beneath the seats. The object of the tubes was to prevent the belt from being blown off the rim of the fan. A tachometer gives a direct indication of its speed of rotation. The transmitting set, consisting of ¼ kilowatt, quenched gap, transformer, helix and condensers was placed aft. The adjustment of the wireless apparatus was calculated beforehand and the only wave regulation used was obtained by raising and lowering the antennæ. The latter was manipulated by means of the hand reel shown in the photograph and was adjusted until the maximum radiation was indicated by an ammeter placed in the antennæ circuit.

The key, which was strapped to the operator's knee, had two contacts, one of which put the generator in series with the transmitting set, while the other connected it to an artificial resistance of the same value as the set. As one or the other of these was always in circuit, the load on the generator was fairly constant and the fan did not "race."

No attempt was made to break long distance transmission records, the object of the experiments being primarily to determine the efficiency of the aerofan. It is stated that the results obtained were entirely satisfactory, messages being transmitted to the land station frem the aeroplane at a considerable height and on volplane as well as on straight away flight.

MARCONI MESSENGER IN UNIFORM

Dressed in a suit of gray with crimson trimmings and brass buttons, the first uniformed messenger of the Marconi Wireless Telegraph Company of America has made his appearance in New York City. On his collar are gold-plated emblems representing electric waves and the name "Marconi," the latter being lettered in red. He carries a red leather pouch in which to safeguard messages.

NEW STATION AT PORT OF SPAIN

The new five k.w. Marconi station at Port of Spain has a guaranteed daylight range of 350 nautical miles and communication has frequently taken place at night as far as 1,500 miles. It is always possible to communicate during the day with the Curacao station, which is about 500 miles away. A station has been built at Toco, near Point Galera, which facilitates the means of sending information of shipping to Port of Spain.

IN THE SERVICE

Charles J. Ross, auditor of the Marconi Wireless Telegraph Company of America, has been familiar with short cuts—one of the watch words in efficiency methods—since he was a school boy. Even then he showed a tendency to conquer problems in arithmetic by means of a process of mental gymnastics which enabled him to obtain accurate results without useless expenditure of time or effort. Today finds him solving problems in business in much the same manner in which he overcame difficulties in school.

Born in Brighton, Ohio, Ross was educated in the public schools of Cleveland. Then, like others in the Marconi service, he chose a telegraph office in which to gain his initial experience as a wage earner. He was sixteen years old when he entered the employ of the Postal Telegraph-Cable Company in Cleveland as a messenger, afterwards becoming in turn checker, delivery clerk, receiving clerk and operator.

The Cleveland Telephone Company offered excellent opportunities in its service to young men of Ross' caliber about this time and he left the Postal company to join the telephone company as a line inspector. Promotion eventually placed him in the chair of the manager of the main exchange. Many vexed questions confronted him in discharging the duties of this office, one of his problems having to do with the delay of operators in answering calls. In order to determine the cause of the trouble he was compelled to reckon the average time consumed by each operator in responding to signals and compare these figures with averages obtained in a similar manner in other exchanges. The figuring involved fractions of seconds, but when it was completed Ross knew exactly where the defects in the system were and how to remedy them.

He came to New York in 1901 to become auditor and accountant in a large department store. The next five years he spent in department store work, being employed by Simpson-Crawford Company, O'Neill Adams Company and Chapman & Co. During this period he was engaged not only in figuring statistics and striking averages, but in studying men and methods of fitting them to their work.

Public accounting attracted him as a vocation in 1907 and he became connected with the Audit Company of New York. He remained in the employ of this company for several years, acting as auditor, supervisor of business systems and bank examiner. He was afterwards employed by Arthur Young & Co., of New York, accountants and auditors, becoming chief accountant and supervisor of business systems. He left this firm on June 1 to enter the service of the Marconi Company.

As a public accountant he has audited and systematized more than 100 corporations. These include the International Agricultural Corporation, the Indian Refining Company, the Newport News & Old Point Comfort Street Railway Company and subsidiary companies, the American Cement Company, the Granby Consolidated Mining, Milling and Smelting Company, the Western Savings Fund Society of Philadelphia, the First National Bank of Baltimore, Gimbel Brothers of Philadelphia, Simpson-Crawford Co., Moore & Schley, Dick Brothers & Co., Finley, Barrell & Co., brokers, of New York; the National Light, Heat and Power Company, and the United Textile Corporation. The extent of this work can be better realized when it is understood that each corporation requires a different auditing system and separate systematizing methods.

Whistles to his friends in the Continental code

The Evolution of an Operator

By H. A. Eveleth

IT was in an embryonic state of mind and a number of years ago that I visited a friend and first viewed a toy electric train. Then and there I caught the fever. On my way home I determined to experiment on my own hook.

The first experiment consisted of ringing an electric door bell. I had the bell but lacked the current with which to ring it. The construction of a suitable cell was attempted and this was accomplished after considerable labor and many references to the intricacies of the regular door bell battery. But in setting the cell down on the floor, gravity got the better of my hand and the jar was cracked and the cell made useless; incidentally, too, the plaster on the parlor ceiling below was partially tinted.

But that bell had to ring, so another method of procedure was followed. The house was wired for electric lights, and in the room where the experiment was being conducted was located the cut-out box and main switch. Certainly, here was enough current to ring the bell!

One of its terminals was carefully connected to one arm of the switch. Another wire was connected to the other terminal of the bell, and, holding the free end of this wire in my hand, I cautiously touched it to the second arm of the switch. The bell rang—for a second—then it jumped into the air amidst a cloud of smoke.

That evening I studied by the light of an oil lamp; the next day an electrician came around and replaced a blown fuse. Thereafter the electric light mains were treated with due respect.

During the next year much apparatus was constructed. Junk would be a better name for it. Everything from a magnet to a cent-in-the-slot shocking-machine had its place. A telegraph system was rigged up with the next door neighbor's son, and communication carried on at a three-word-per-minute rate. Until the operators at both ends of the line became more or less proficient in their work, about eighty per cent. of the communication was accomplished by means of the vocal chords.

The construction of an electric furnace

to be operated by the "110" was next attempted. Resistance was somewhat scarce around the "laboratory" in those days, and before a satisfactory arc was obtained seventeen fuses were brought to grief.

Then came the wireless fever. It was a severe case, followed by long convalescence. That first receiving set was a wonder! It consisted of two carbon blocks, across which rested a knitting needle, a telephone receiver and a battery, and an aerial consisting of a few wires strung up in the attic. Ten minutes after it was completed the "110" was accidentally grounded through the receiver. The remains were laid away the next day.

The second set was a great improvement. It included instruments by means of which incoming signals could be tuned in or out. The back lawn was adorned with aerial wires, and a ground switch was installed to take care of Old Jove. After two weeks of failure the set actually worked, and the thrill of joy which the first signal caused will never be forgotten!

The apparatus was complete but it lacked an operator. During the following months many nights were spent endeavoring to master the code; this accomplished, the practical side of the art was partly learned.

A transmitter was then added to the equipment; it consisted of a spark coil connected to aerial "direct." Imagine the decrement, you radio inspectors, who since have spoiled the happy days when interference was at a maximum.

By this time I had acquired the aspects of a full-fledged "ham," which, as everyone knows, is the most dangerous stage of the fever. It is the period during which the amateur sees aerials hanging from every tree, whistles to his friends in Continental code, dreams of wireless and fails in his lessons. Every amateur passes through this stage . . . and thereafter treats the subject in a more practical and scientific manner.

When I had passed safely, the construction of more up-to-date and more powerful apparatus was attempted. A transformer was installed, operated by the "110." Trouble now came in plenty! The induction from the aerial affected the telephones round about. Every time the set was operated most of the telephones in the neighborhood were put out of commission. After a searching investigation the telephone company remedied the trouble.

Whenever the transformer was operated the electric lights "blinked" all over the neighborhood. Thus a pleasant conference with the electric light company was afforded. The neighbors, of course, held me in high esteem by this time!

As time went on improvements were constantly made, additional knowledge gained and—well, the trials and tribulations in the evolution of one self-created operator have ended with experience's knowledge.

ARGENTINE REGULATIONS

The regulations prepared by the Argentine Ministry of Marine for the wireless telegraph service, have been published by the Boletin Official (Buenos Aires). Merchant vessels carrying fifty or more persons on board must, unless they are specifically exempted, be provided from the time they are put into commission with wireless telegraph installations. A similar rule applies to all craft leaving or entering ports of the country. The equipment must have at all times a minimum transmitting power of 200 kilometers (124 miles) in the case of river vessels, and 500 kilometers (310 miles) in the case of seagoing vessels.

For administration purposes in connection with the wireless service the republic has been divided into two zones, maritime and land. The maritime zone comprises all stations working territorial waters and on navigable rivers, as well as those on land installed within 100 kilometers of the coast and the River Plate and fifty kilometers of the banks of the other navigable rivers; the land zone includes all other stations.

The Japanese Telegraph Administration has announced that the coast stations at Choshi, Fukkikaku and Dairen-wan will send messages to ships at sea regarding typhoons reported by the Central Meteorological Office at Tokio.

From and For those who help themselves

Experimenters' Experiences.

The editor of this department will give preferential attention to contributions from amateurs covering the design of transmitting sets, wave-meters, etc. There is an over-supply of material on receiving tuners, particularly "loose-couplers," the designs for the majority of which present nothing new or original.

FIRST PRIZE, TEN DOLLARS
Design for a Receiving Tuner of the Panel Board Type

Receiving apparatus of the panel board type of construction is rapidly displacing the usual design where the complete apparatus represents several isolated and individual units. Believing that many of your readers will be interested in the construction of a set of this type I herewith present the details of a suggested design. All adjustments connected with the variable features of this apparatus are made from the outside of the box by conveniently placed handles or knobs. The panel board itself is made of polished hard rubber, while the entire apparatus is contained in a case of hard wood.

The component parts of the complete set are placed as follows: Referring to the drawing of the front elevation, the primary tuning condenser is placed in the upper left hand corner, while directly underneath it is placed the tap-off switch for variation of inductance in the primary winding. The variable condenser for the secondary winding is placed in the upper right hand corner and directly underneath it the variable switch for the inductance values of the secondary winding. The former switch has 20 points and was especially designed to minimize troubles due to poor contact.

At No. 1 in the drawing a brass sector is indicated which is used to make connection with the contact lever. The contact lever is made of phosphor bronze, one end being bent at right angles to the contact point so as to make a knife edge contact which, as is well known, does not allow dust to collect on the contact point. The knob and lever which control the coupling between the primary and secondary winding are also shown mounted at the lower right hand corner of the drawing. Here No. 3 is the lever which moves the secondary coil in and out, while No. 2 is a brass sector. No. 4 is an arm which connects the primary coil with the lever. No. 5 is a coupling control handle; No. 6 is the secondary tuning switch handle, while No. 7 is a brass bracket for holding shaft. No. 8 and 8′ are brackets that hold the rod upon which the primary and secondary tuning inductance is mounted. The secondary coil also moves on this knob.

The primary winding of the tuning inductance is 4 inches in diameter wound closely with No. 24 D. C. C. wire. The diameter of the secondary winding is slightly less. It is 4 inches in length and is wound with No. 32 D. C. C. wire. There are 20 values of inductance taken from the primary coil and 6 from the secondary coil.

The detector is placed in the center of the panel board, the design being much similar to that which appeared in my article in the March, 1914, issue of THE WIRELESS AGE. The mineral cup can be rotated so as to enable the operator to adjust the detector.

The stopping condenser was purchased from a dealer in wireless telegraph apparatus.

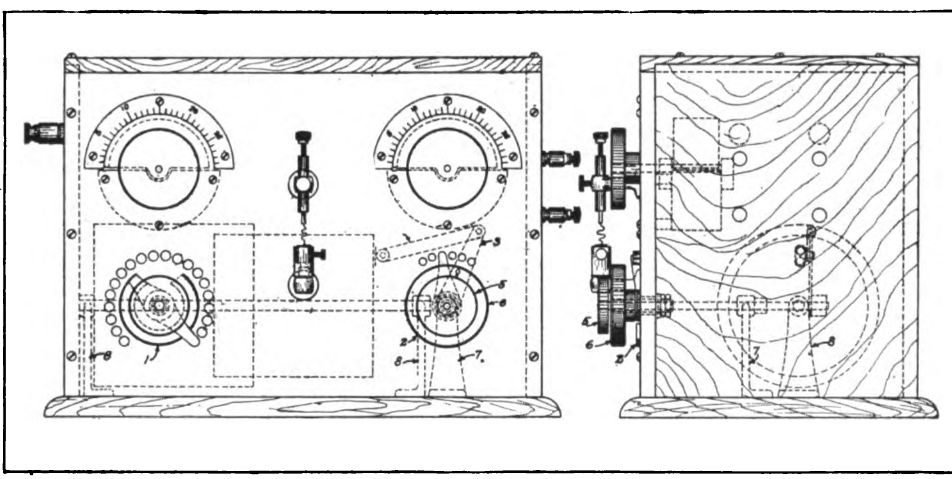
The binding posts for the earth and the aerial connections are placed on the right hand end of the cabinet. On the left hand end are the terminals for the telephone receiver.

The receiver is designed to work on wave-lengths up to 2,500 meters which are easily obtained by using the two variable condensers which, as stated before, are shunted across the primary and secondary windings.

No attempt has been made to give dimensions in connection with this set, but it is suggested that the scale notation given at the foot of the drawing be used, if possible.

If the builder desires this equipment to present an extremely neat appearance he should construct the box of mahogany. I have designed a set similar to this and have been commended several times for the high degree of efficiency obtained.

RALPH HOAGLAND, *Massachusetts.*



Drawing, First Prize Article

SECOND PRIZE, FIVE DOLLARS

Ajax Rotary Spark Gap

I recently designed a small rotary spark gap for use with an Ajax battery motor which I thought would be of interest to your amateur readers. A top view of the complete outfit is shown in Fig. 5, a side elevation in Fig. 4, and a front elevation in Fig. 6. The constructional details are given in Figs. 1, 2 and 3 which should be sufficiently clear to require no detailed explanation. It will be observed that the disc for the gap is 3¼ inches in diameter and has 12 discharge points. It is made of aluminum which is an important consideration when used in connection with a small motor. The disc is ⅜ of an inch in diameter. The stationary electrodes for the disc are mounted in a specially designed binding post with a 1-16 of an inch slot, as shown in Fig. 3. The disc is mounted on the shaft by means of an insulating collar turned from a circular piece of hard rubber. The remaining details will be quite clear from the drawing.

Instead of operating the motor by means of dry cells, I constructed a special step-down transformer which gave about 12 volts in the secondary winding from a 110-volt source of supply. I connected in series with the 12-volt circuit a resistance coil to regulate the speed. This coil of resistance was

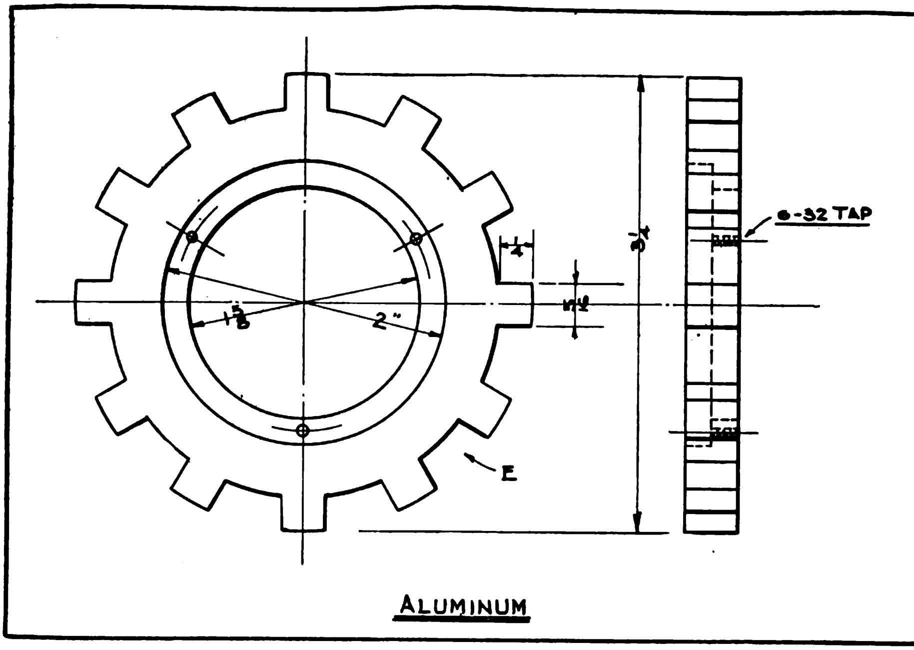


Fig. 1, Second Prize Article

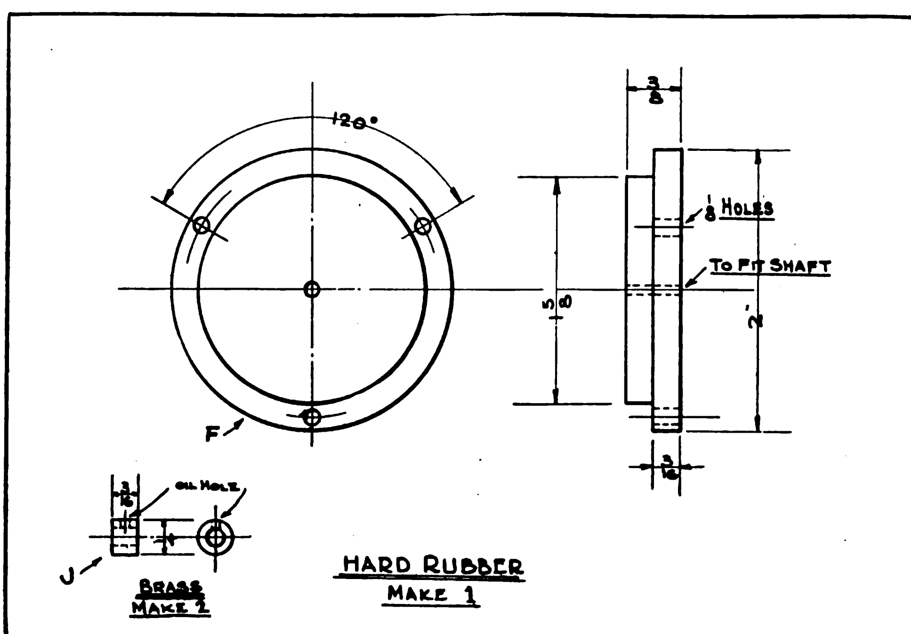


Fig. 2, Second Prize Article

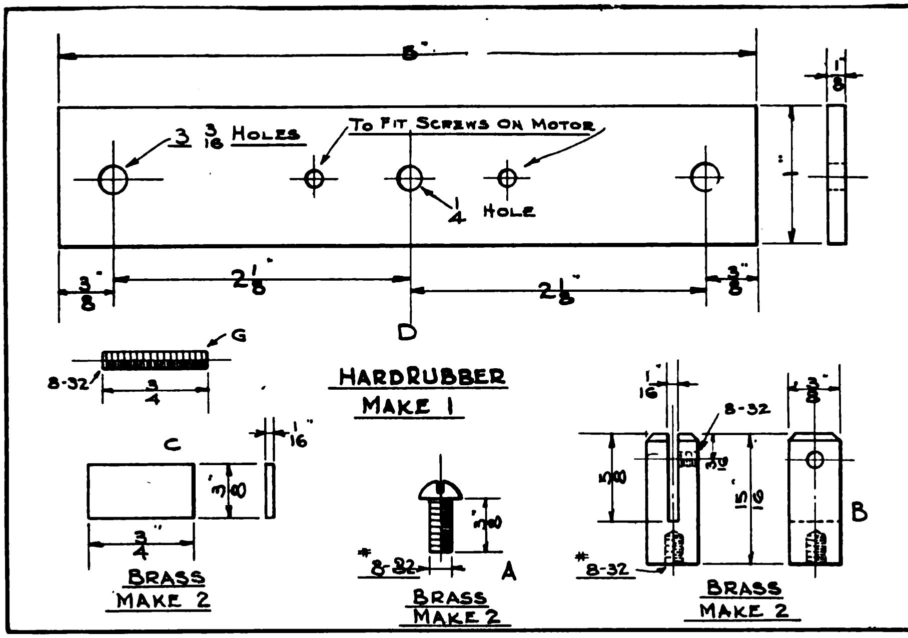


Fig. 3, Second Prize Article

wound on a tube ½ inch in diameter by 9 inches in length and comprised two layers of No. 18 magnet wire. Inside the tube I placed an iron core which was so constructed that it could be drawn in or out, thereby regulating the current flow. In this manner the speed of the motor is definitely controlled.

I find from my experience that the motor can be run continuously for half an hour before heating appreciably, so that for the average amateur's work it will be found entirely satisfactory. The one I constructed has been in use continuously for six months and is still giving satisfactory service. I use this rotary gap in connection with a ½ k.w. transformer.

O. COTE, *Rhode Island.*

THIRD PRIZE, THREE DOLLARS
A Box Kite for Portable Wireless Telegraph Sets

An interesting diversion from the general run of amateur experiments is to suspend an aerial at a considerable height by means of box kites. By proper design a kite may be constructed that will hold into space an aerial of aluminum wire having a length of from 600 to 1,000 feet. The approved plan is to send the kite to a height of from 2,000 to 3,000 feet, the kite being held into space the first 2,000 feet by the regular kite flying cord, the remaining 1,000 feet consisting of aluminum, copper or finely stranded steel wire.

For the readers of THE WIRELESS AGE

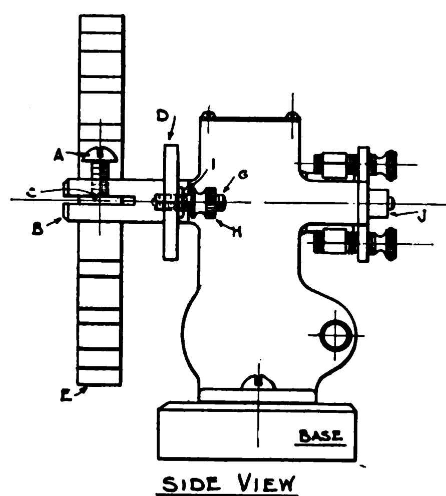


Fig. 4, Second Prize Article

who wish to engage in this form of experiment I have drawn a design of a box kite which has been thoroughly tested. Referring to the drawing: The sticks for the frame should be made of

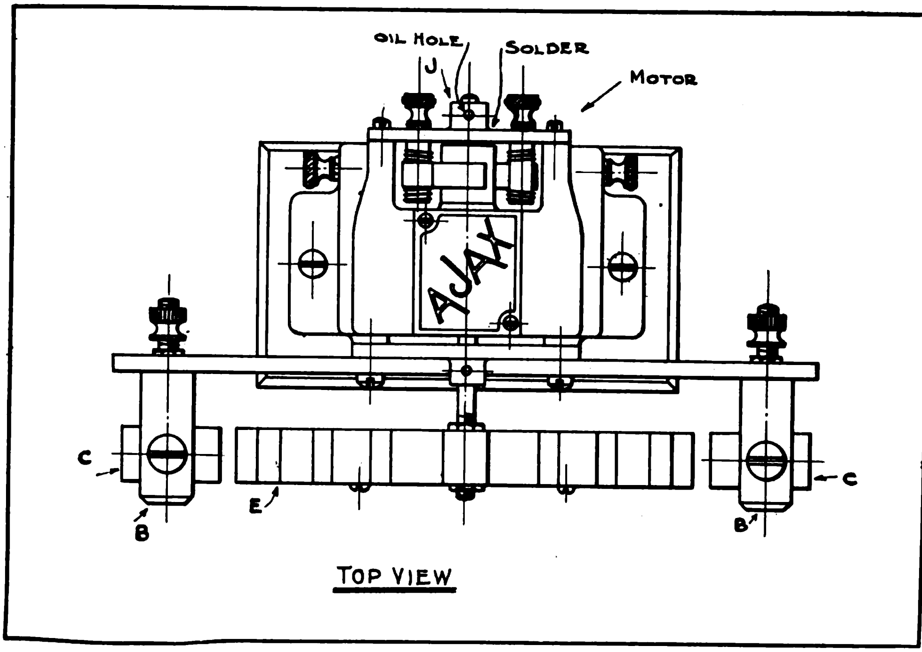


Fig. 5, Second Prize Article

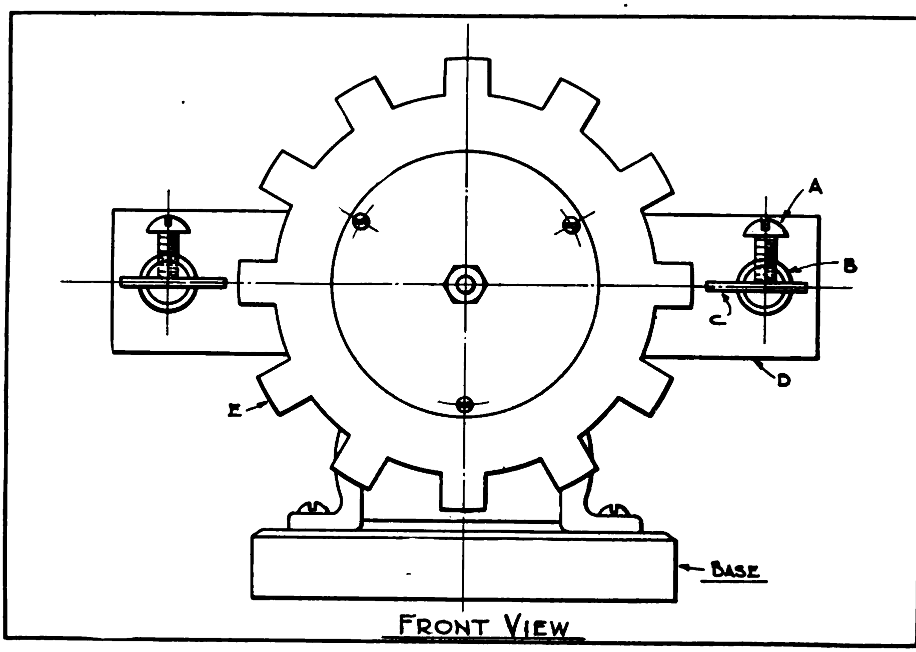


Fig. 6, Second Prize Article

LIST OF PARTS—SECOND PRIZE ARTICLE

Make 2 as shown at A in Fig. 3 Brass.
Make 2 as shown at B in Fig. 3 Brass.
Make 2 as shown at C in Fig. 3 Brass.
Make 1 as shown at D in Fig. 3 Hard Rubber.
Make 1 as shown at E in Fig. 1 Aluminum.
Make 1 as shown at F in Fig. 2 Hard Rubber.
Make 2 as shown at G in Fig. 3 Brass.
Make 2 as shown at H in Fig. 4 Brass.
Make 2 as shown at I in Fig. 4 Brass.
Make 1 Base to suit.
2 6-32 Rd. Hd. Br. Mach. Scs.
2 6-32 Hex. Br. Nuts and 2 Washers.
Make 2 as shown at J in Figs. 2 and 4.
Make 1 New Shaft 3 inches long.

straight grained wood which may be of spruce, basswood, maple wood or pine. The longitudinal corner spines, A, A, should be 3/8 of an inch square and 72 inches in length. The 4 struts should be 3/8 of an inch by 1/2 inch and about 41 inches in length.

Two cloth bands should be made to exact dimensions. The ends of the bands should be lapped at least 1 inch and served double to give extra strength. There are several kinds of kite cloth which may be used for this purpose, among which may be mentioned lonsdale, nainsook, cambric, or light percaline.

The four struts (b) should be cut a little over dimensions so that they will be slightly bowed when in position. This will hold the cloth taut and flat. They should be tied together at the points of intersection and the ends should be tied with coarse, waxed thread shown at (c) to prevent splitting.

The small guards (k) are glued to the longitudinal sticks to prevent the struts from slipping out of place. The ends of the struts, if desired, may be fastened to the longitudinal strips, but if made as described the kite may be readily disassembled and rolled up. The bridle for the kite is represented at e, f and g.

A box kite of this construction is particularly suited for flying in heavy wind and by using several kites in tandem an aerial of any dimensions desired may be raised into space. For receiving signals from the very high power stations the antenna should be from 1,000 to 1,500 feet in length, but for ordinary receiving work from commercial stations the aerial need not be more than 400 to 500 feet in length.

ROY THACKER, *California.*

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE

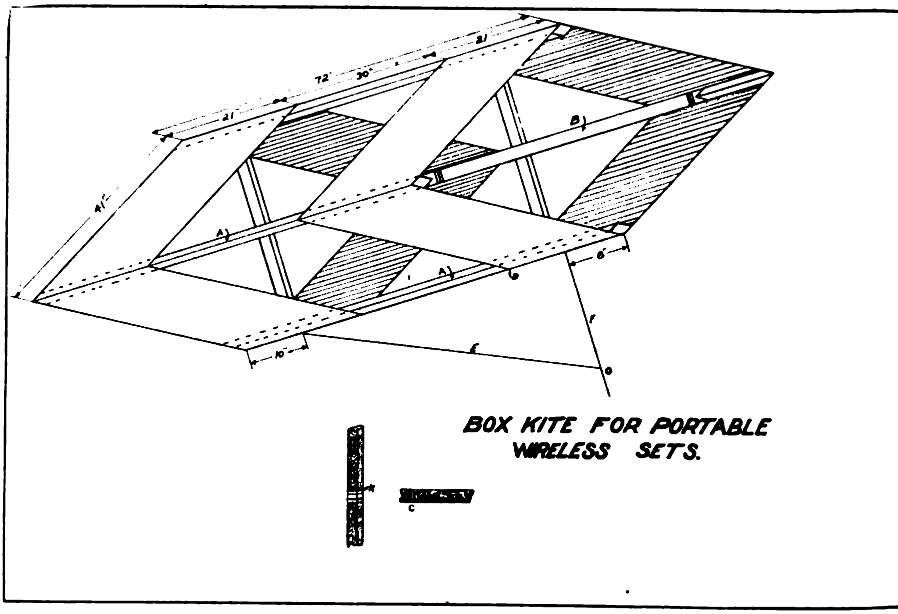
An Oscillation Transformer

After considerable experimenting with various types of oscillation transformers, I have finally designed one which I find gives a marked degree of efficiency. I consider my design particularly suited to amateur workers as it is not very complicated and easy of construction.

To comply with the government regulations the sending set must emit a feebly damped wave. To produce a wave of the desired characteristic an oscillation transformer of the inductively coupled type is preferable. With my design a wave of the desired sharpness may be readily obtained on account of the fact that the secondary winding can be drawn in or out of the primary winding to any distance desired.

The primary and secondary windings are wound parallel to each other, the primary winding being made of No. 10 spring brass wire and the secondary winding of No. 8 spring brass wire.

The details of construction are as fol-



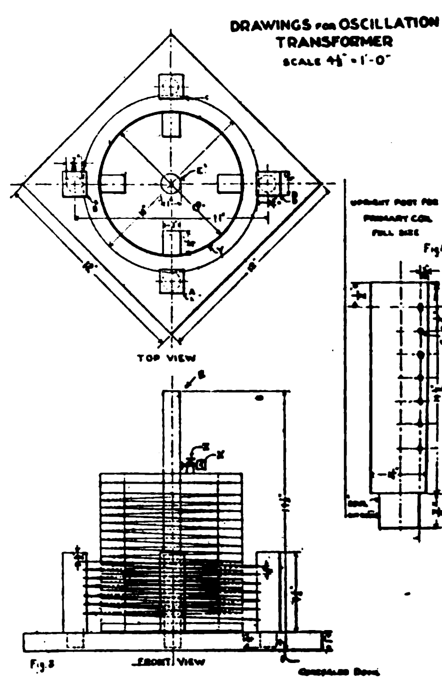
Drawing, Third Prize Article

lows: The primary winding is mounted on a piece of wood 1 inch in thickness and 12 inches square. Five holes are drilled to a depth of ¾ of an inch, as shown in Fig. 1 at points a, b, c, d, e.

Next obtain four pieces of wood 1¼ inches square by 4½ inches by ¾ of an inch in thickness. Holes are drilled in this piece to receive the wire, as shown in Fig. 2. Care should be taken to drill the holes one or two sizes larger than the wire in order to let the wire slip through freely. The ends of these pieces are then cut into a dowel ⅞ of an inch in diameter and ¾ of an inch in length; they are now ready to be fastened to the base. A small amount of cabinet maker's glue is secured and put into the holes in the base and the dowelled parts of the uprights are placed in the holes and held tight by bench clamps until the glue becomes hard. The primary winding which, by the way, consists of 6 turns of No. 8 spring brass wire, is next put into place.

The secondary winding is of the ordinary helix type, 8 inches in diameter and 9 inches in height, comprising 16 turns of No. 10 spring brass wire. The secondary winding is slid in and out of the primary winding on the rod, e, and is held in place by a binding post, as at z. This post is tapped with a 8/32 thread to receive the rod, X, which is also threaded in the same manner.

When the proper value of coupling is obtained the knob at the end of the rod.



Drawings, Fourth Prize Article

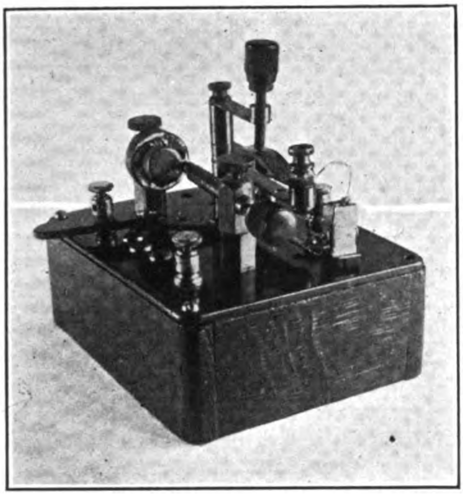


Fig. 1, Honorary Mention Article, Manson C. Wood

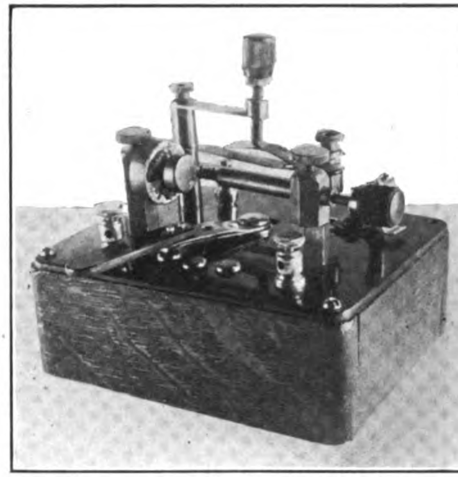


Fig. 2, Honorary Mention Article, Manson C. Wood

x, is turned until the secondary winding is held tight in place.

The woodwork should be treated to match the remaining apparatus in the complete set. Contact clips are used for making connection with the turns.

EMIL J. MEYER, JR., *Pennsylvania.*

HONORARY MENTION

A Detector Mounting of Merit

The tendency among the more advanced amateurs of to-day is to produce, if possible, a neat, compact and well-working receiving set. It is generally preferred to use two receiving detectors of the rectifying type having different degrees of sensitiveness; that is to say, one should be of a rugged nature—not easily "knocked" out by atmospheric electricity or nearby transmitting sets—while the other may be extremely sensitive and used for long distance work only.

In order to make a compact unit of two sets of detectors I mounted them on the top of a small case having a hard rubber top, as per Figs. 1 and 2. The case is 4¾ inches in length by 3¾ inches in width by 1½ inches in height, made

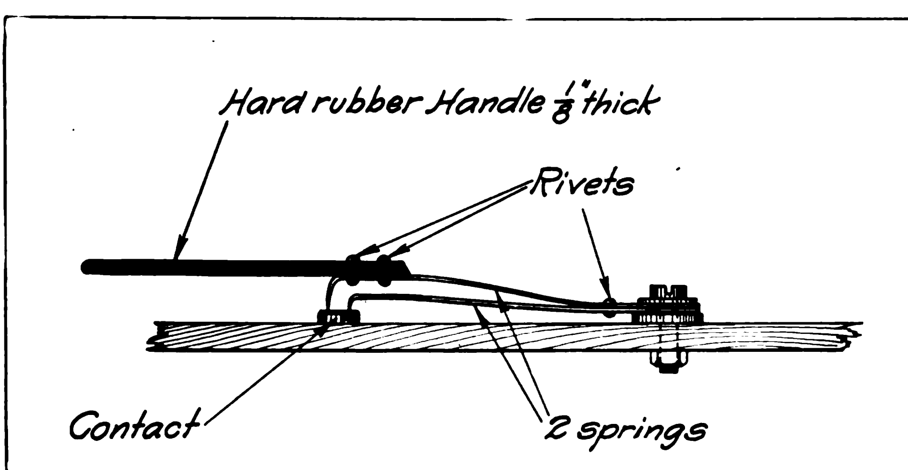


Fig. 3, Honorary Mention Article, Manson C. Wood

of any suitable stock ¼ or ⅜ of an inch in thickness. The hard rubber top is ⅛ of an inch in thickness. A perikon and galena detector are mounted, as shown in the drawing, in connection with a 3-point switch. This switch should, by all means, be of the knife edge type, making a positive and self-cleaning contact. The switch I constructed is made of two spring brass blades operated by a hard rubber handle. Invariably when looking between the contacts of this

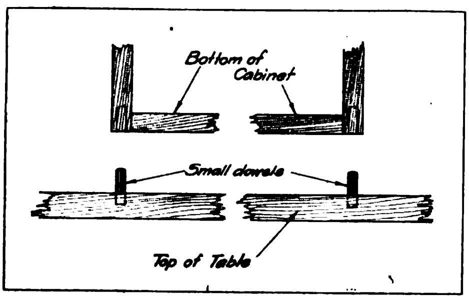


Fig. 4, Honorary Mention Article, Manson C. Wood

switch, I find that there are a number of brass filings, which is a positive indication that the switch is making a good contact. The instrument is held firm to the table by means of small pegs which are placed into holes drilled on the under side of the case (Fig. 3).

I find from the general run of experiments that perikon and galena are the two best detectors for amateurs' work, but I also find that only about one piece in fifty of galena crystals is satisfactory or sensitive; but when that piece is discovered and contact is made with it by means of a strand of steel picture cord wire, the combination is about as sensitive as can possibly be desired. Whenever the crystal seems to become less sensitive I find that it may be restored by simply cutting the tip off the wire, thereby presenting a fresh, clean surface.

I employ the following method in locating a sensitive galena crystal: I usually buy a quantity of galena, break it into small pieces, place these small pieces on a piece of tin-foil which is connected to one terminal of the detector circuit of the receiving set and adjust it for receiving. I connect the opposite terminal of the detector circuit to a small wire and test consecutively the various pieces. In this way a sensitive crystal is easily located.

MANSON C. WOOD, *Mass.*

HONORARY MENTION
The Construction of Quenched Spark Plates

The construction of the plates for a quenched gap is often a puzzling matter to the amateur experimenter. The designs shown in Figs. 1, 2 and 3 are therefore recommended. By reference to Fig. 1 and Fig. 2 it will be observed that one complete plate for the gap comprises three copper discs. Two of these discs are 4 inches in diameter by ⅛ of an inch in thickness, while the other is 5 inches in diameter by 1/16 of an inch in thickness. A groove is made on one side of the two thick plates, as shown in the diagram, Fig. 1. The three copper discs are then fastened together by means of 8/32 machine screws, as shown in Fig. 2. The disc of the larger diameter acts as a cooling flange, while the two discs of smaller diameter constitute the spark discharge surface. The spark takes place on the inside of the groove and the surface should therefore be very carefully and evenly ground.

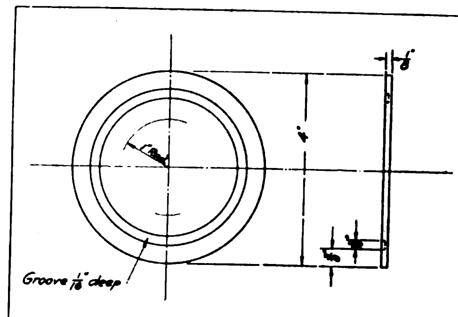
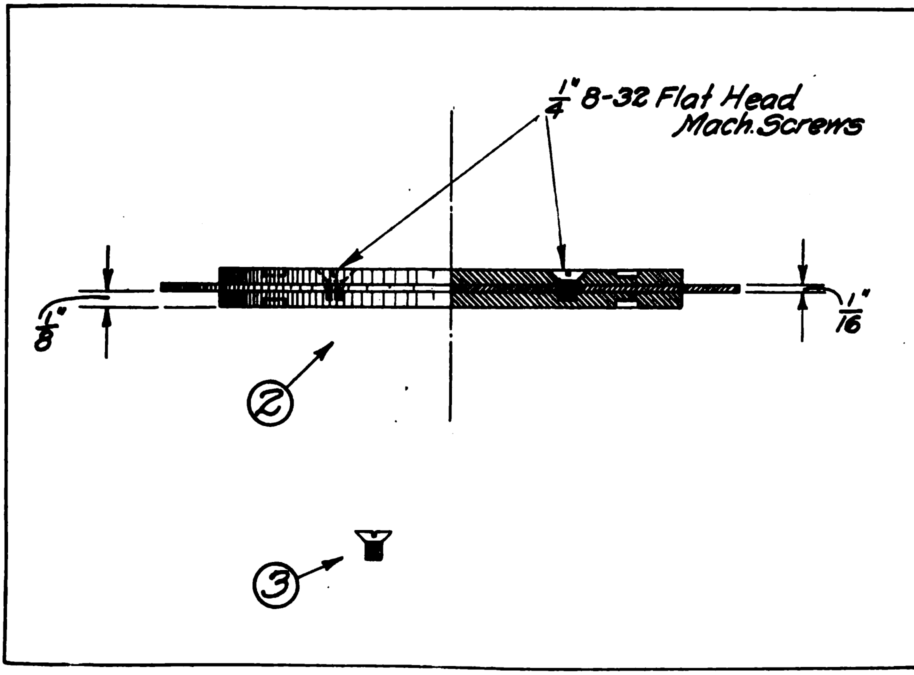


Fig. 1, Honorary Mention Article, Justice Stephen

Of course, the complete gap will comprise several of these plates, the number to be used depending upon the size of the outfit. For the average amateur ¼ k. w. set there should be from 7 to 9 plates, while for the smallest spark coil set the gap need not comprise more than



Figs. 2 and 3, Honorary Mention Article, Justice Stephen

HONORARY MENTION ARTICLE, JUSTICE STEPHEN

No.	List of Parts	No. Parts Required	Material
1.	Copper Disc 4" Diam. ⅛" Thick..	2	Copper.
2.	Brass F. H. Machine Screw......	2	Brass.
3.	Copper Disc 5" Diam. 1/16" Thick..,	1	Copper.

3 or 4 plates. In assembly the plates are stacked over one another, being insulated by micanite washers. This material may be purchased from electrical supply houses in square sheets and then may be cut to the desired shape by a pair of sharp pointed dividers. The inside diameter of the mica rings should be such that the mica washer will extend to just the center of the groove. Care should be taken that this washer does not extend beyond the inside edge of the groove, because if so it will be burned and cause a short circuit between the plates. The plates when completed should be mounted in racks so that they can be pressed closely together with considerable pressure, in fact, if possible, the gap between the plates should be made air-tight, otherwise the quenched gap will soon become inoperative.

JUSTICE STEPHEN, *New Jersey.*

NOTE.—While a quenched gap plate of this construction is suitable for ordinary amateur work, the cooling flange will not be as effective in cooling the spark as could be expected from that design where the cooling flange is cast solidly with the plate.—TECHNICAL EDITOR.

HONORARY MENTION
HOW TO REMOVE TARNISH

I have found that tarnish may be removed from copper and brass by simply rubbing the metal with a common ink eraser. The "grit" in the eraser removes the tarnish without scratching the metal.

I thought this advice might be of assistance to the readers of THE WIRELESS AGE.

WILLIAM A. CAWLEY,

Chapter XIII

THE service regulations of the International Radiotelegraphic Convention declare that "all stations are bound to carry on the service with the minimum of energy necessary to insure safe communication." The stated conditions practically imply that the transmitting set must be fitted with appliances that will enable the emitted energy to be progressively reduced from a maximum to a zero value.

The radiation from an aerial set into excitation by the ordinary spark type of transmitter may be reduced by any one of the following methods:

1. The open and closed circuits may be thrown into dissonance (out of resonance).
2. A reactance coil may be connected in series with the primary winding for reduction of energy flowing to the transformer, or a high tension reactance may be connected in series with the secondary winding.
3. The voltage of the alternating current generator (source of energy) may be reduced to any desired value by means of a field rheostat.
4. The degree of coupling between the primary and secondary windings of the oscillation transformer may be reduced from a maximum to a zero value.

In the case of the plain or rotary spark discharger, the fourth method is by all means to be preferred because no readjustment need be made of the generator voltage or the length of the spark gap. The tone or note and regulation of the spark gap thus remain practically normal and constant throughout the entire range of antenna currents. If, however, methods Nos. 1, 2 and 3 were employed, total readjustments of the variable elements of the circuits would be required in order to produce a clear note and efficient working. Again, when the open and closed circuits are detuned a complex wave is emitted which might be more detrimental to interference than a single wave of increased strength.

If a reactance coil is inserted in series with the primary winding, a complete readjustment must be made at the spark gap in order to secure a reasonable degree of working qualities. In the case of the plain spark discharger under these conditions, the length of the spark gap must be decreased. It is invariably found that when a reactance coil is inserted in series with the primary winding that the note of the spark becomes rough and disagreeable to the ear. In the case of the rotary spark gap discharger, as reactance is inserted in series with the primary winding of the transformer, the movable electrodes must be shifted in order to obtain resonance and produce a

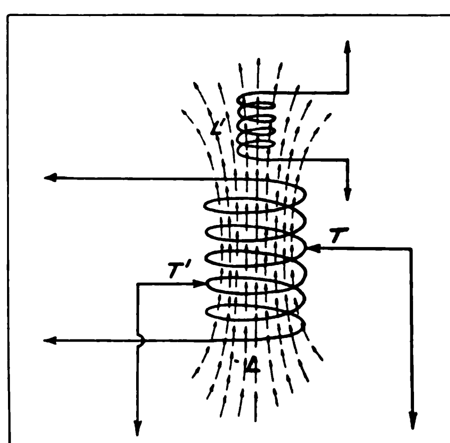


Fig. 1

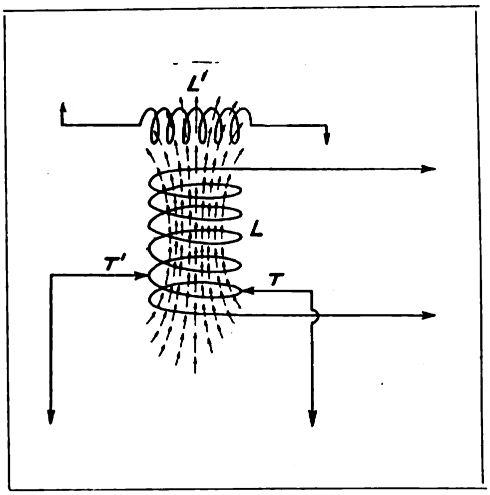


Fig. 2

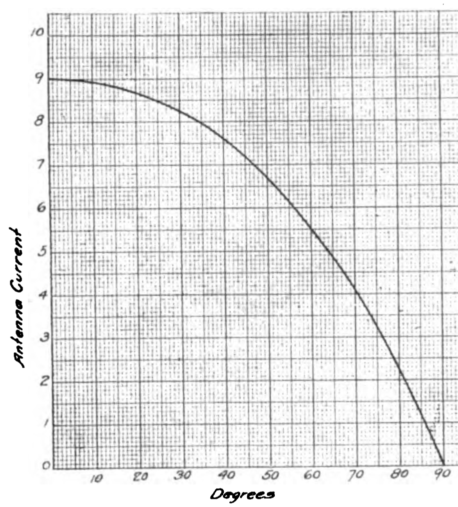


Fig. 3

clear note. The foregoing statements in respect to readjustment, practically apply to method No. 3, in which the generator voltage is reduced. As intimated before, by the use of method No. 4, the adjustments of the set, as a whole, are in no wise disturbed.

Method No. 4 will become clear by inspecting Figs. 1 and 2, in which the usual oscillation transformer is represented by the primary winding, L′. The winding L, has two variable tap-offs, T and T′, which enable the wave-length of the condenser circuit to be altered as desired. The winding, L′, is generally of a fixed value of inductance and as formerly used was so constructed that it may be drawn up and down from the winding. L, or if necessary, telescoped completely inside of L.

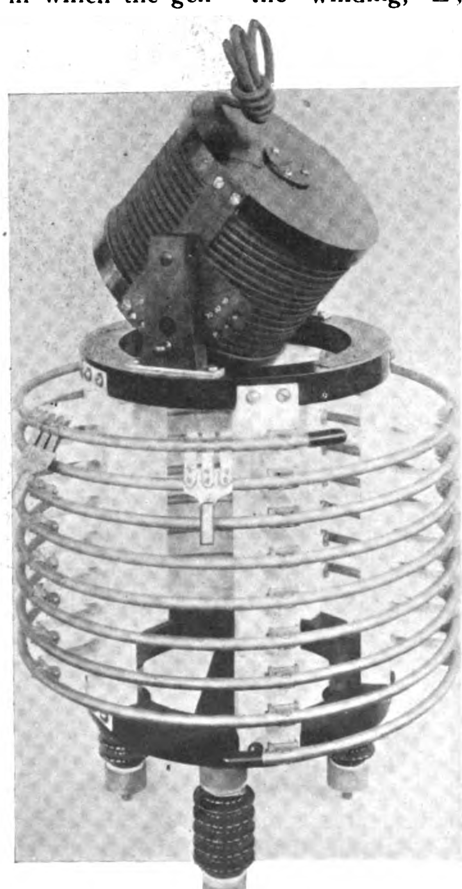


Fig. 4

It is found by experiment that if the antenna current is reduced by drawing the winding, L′, vertically from the winding, L, that the distance between these two helices for a zero value of current in the antenna circuit is so great, as to be inconvenient for installation in the average ship wireless cabin. It has, therefore, been decided to decrease the degree of coupling by turning the secondary winding L′, progressively at right angles to the winding L.

When L′ is in the position shown in Fig. 1 the lines of force emanating from the primary winding take the path shown, alternating, of course, with the reversals of current in the primary windings. In this position, L′ receives the maximum energy from the primary windings, but if L′

is placed in the position shown in Fig. 2, it is at once evident that the lines of force from L do not cut the turns of L′ at right angles, but move parallel to angle which the winding, L′, makes with L. Hence we have an efficient method by which the current flowing in the antenna circuit may be reduced to a zero

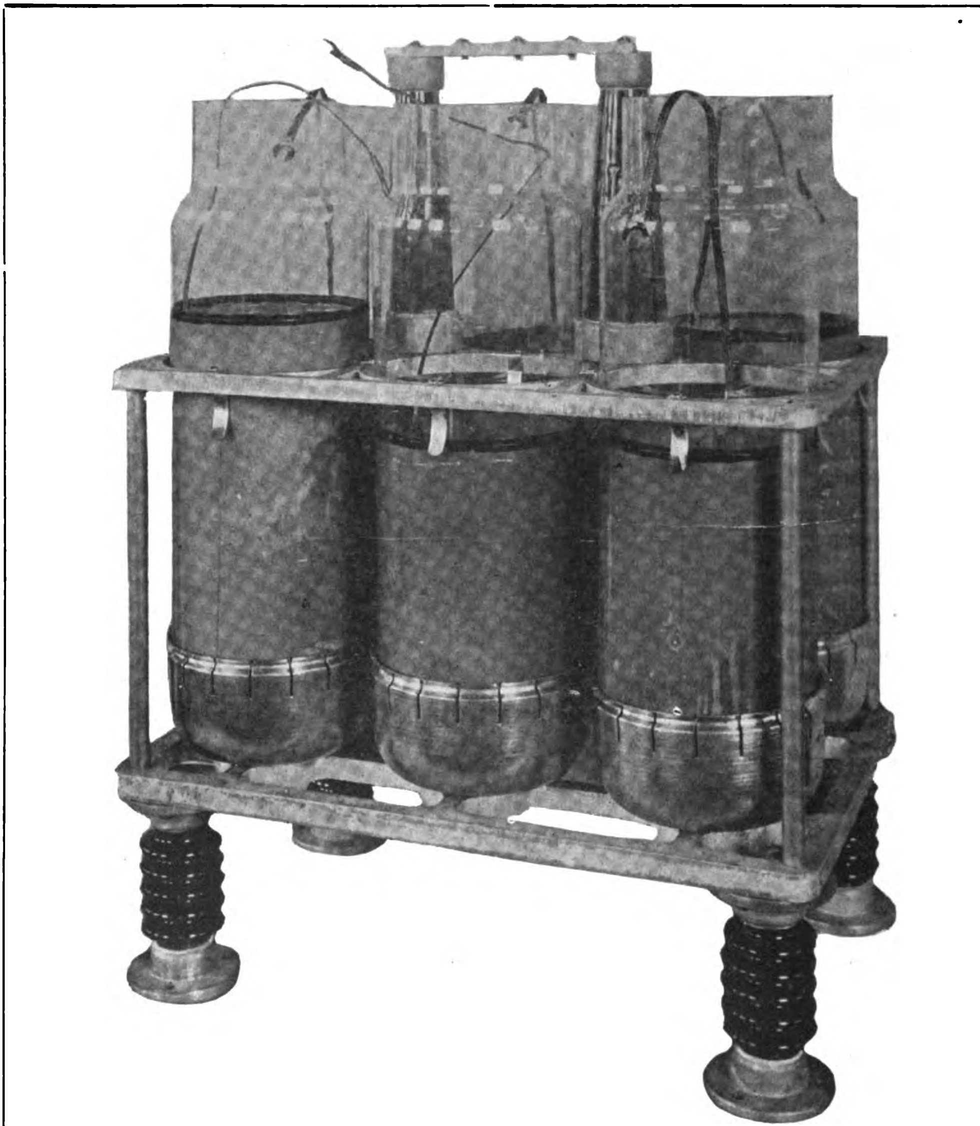


Fig. 5

them. Therefore, very little or no energy will flow in L′. It is likewise plain that if the winding, L′, is placed in any intermediate position between that indicated in Figs. 1 and 2, it will be partly cut by the lines of force from L and the energy flowing will depend upon the value and the radiation or effective range of the set accordingly.

Furthermore, the effective range of the transmitting set is decreased not only on account of the reduction of antenna current, but also because of the fact that the damping decrement of the antenna

circuit is decreased and the emitted wave, therefore, has a lower decrement.

The Quenched Spark Set

In the case of the quenched spark transmitting set, the method described for reduction of power is not feasible. Hence the effective radiation is decreased in the following manner: The design of the set is such that the power increases as the square of the number of gaps in use; that is to say, if ten gaps represent full power, the power would be 10 squared = 100. Therefore, the effective antenna current is decreased by a reduction of the number of gaps in use and the note is then cleared by a reduction of the alternator voltage.

Adjustments by a reactance coil in the primary or secondary circuits of the power transformer or by coupling alone are not feasible with this type of apparatus, because such alterations result in an impure note or tone, which is detrimental to the general working qualities of the set. A typical curve showing how the antenna current may be decreased by variation of coupling in the case of the rotary spark discharger type of transmitter is shown in Fig. 3, where the abscissa represents the angle of difference between the axes of the primary and secondary windings, and the ordinates the corresponding current in amperes. It will be observed that a 90° change is required to give zero current in the antenna circuit.

Operators in the Marconi service should take particular care to make full use of this variable coupling feature; when within a few miles of a receiving station they should reduce the antenna current to that value which will insure communication. A photograph of the Type "A" oscillation transformer as constructed by the Marconi Company with the variable coupling feature as described is indicated in the photograph (Fig. 4). The secondary winding is partly tilted in relation to the primary winding. Ninety degrees on the scale represent the loosest coupling, while at the zero position the axis of the secondary winding is exactly in line with that of the primary winding.

The Leyden Jar Condenser

While the general over-all efficiency of the oil flat plate glass type of transmitting condenser cannot be denied, it is inconvenient for overhauling in case of puncture of a plate at sea. A condenser of the Leyden jar type is far more feasible because in case of puncture it is not necessary to disassemble the entire condenser unit and the punctured jar may be replaced without disturbing the remainder of the unit.

The marine equipment of a Marconi set at present comprises the condenser unit shown in Fig. 5, where an aluminum rack supported by corrugated insulators contains six standard Marconi round bottom jars, each having a capacity value of .003 microfarads; the total unit is, therefore, of .018 microfarads capacity. These jars are electrically coated with copper, making a condenser of greater durability than the ordinary tinfoil covered Leyden jar.

When the potential of the power transformer is between 20,000 and 25,000 volts, two of the units are generally connected in series, but for potentials between 10,000 and 15,000 volts a single parallel connection is employed. Flexible copper leads are directly soldered to the inside coating which in turn are connected to a metal bar at the center of the rack which is insulated from the frame proper by porcelain pillars. Contact to the outside coating is made by means of the retaining cups as indicated on the floor of the rack.

OPERATOR IN LUSITANIA ROMANCE

A dispatch from Manchester, England, says that John Welsh, who was at one time employed as a wireless operator at the Marconi station in Honolulu, and Miss Gerta Neilson were married on May 13, as the result of a romance which began on the ill-fated voyage of the Lusitania. Welsh and his bride became engaged on the voyage and were rescued together when the vessed was torpedoed. Both lost all of their savings in the wreck.

Infatuation

O mystic fascination,
  O fate idealized,
I'm but a mass of molecules,
  Reversely polarized.
I'm vanquished by a sorcery
  No amulet can cure,
For, Love, you are the magnet,
  And I the armature.

The more I circle round you,
  Love's current stronger grows,
Till leaping forth from heart to heart,
  Love's arc electric glows.
Against the ardor of that flame
  Insurance won't insure,
For, Love, you are the magnet,
  And I the armature.

The messages unnumbered,
  Of fond endearment fly,
At once, in all directions,
  The wireless they out-vie.
A throbbing heart is at the key,
  Its dots and dashes sure,
For, Love, you are the magnet,
  And I the armature.

I dwell within your field of force,
  In that blest region where
Your strength is to the distance,
  Inversely as the square,
No influence external,
  Can me from you allure,
For, Love, you are the magnet,
  And I the armature.

At last we'll cling together,
  Apart no more to roam,
With hearts attuned harmonic,
  We'll sing of Ohm, sweet Ohm.
One circuit never broken,
  While life and love endure,
Forever you the magnet,
  And I the armature.

—Park Benjamin.

Marconi Men

The Gossip of the Divisions

Eastern Division

Harold Sanders, a graduate of the Marconi School, has been assigned as junior to the El Sol.

H. F. Ward was assigned as junior on the El Dia upon his return from Barbados.

Peter Podell, who made a trip to northern Europe on the Santiago, was assigned to the Millinocket after enjoying a short vacation.

C. R. Underhill, a bright young Marconi School graduate, has been placed on the El Cid as junior.

William Travers is now on the Santiago, a one-man ship.

R. Volker, a member of the recent graduating class of the Marconi School, is now attached to the El Rio as junior man.

A. A. Borch has been re-engaged and is now on the City of St. Louis as second man.

K. H. See has succeeded H. E. Ingalls as senior on the Concho. Ingalls is now senior on the Old Colony, running from Boston to New York. The Old Colony is, we understand, temporarily taking the place of the Bunker Hill, which was damaged in a collision in Long Island Sound. Junior Operator Pitts, now on the Old Colony with Ingalls, narrowly escaped being injured on that occasion.

John Rowland has resigned from the service. John Flagg relieved him on the Wico. Flagg was formerly attached to the Miami of the Gulf Division.

J. R. Lange and E. L. Petit have been assigned as senior and junior, respectively, to the Siberia, a newly-equipped vessel.

J. K. Noble has been re-engaged and is now on the Seguranca.

E. N. Pickerill and H. E. Orben have resumed duty on the Kroonland. This vessel is now on a New York-San Francisco run via the Panama Canal.

J. J. O'Brien has been transferred from the Charlton Hall to the San Marcos.

George Abbott has achieved an ambition he has been nursing for a long time and is now senior operator of the Sabine.

R. D. Giles is now second on the City of Memphis. Joseph Callon succeeds him on the Zulia. Callon is from the Baltimore Division.

C. F. Schafer succeeds A. Jaquette on the Platuria.

Sidney Hopkins is now on the Comus as junior.

R. Myers, of the Baltimore Division, is now on the Astral, succeeding R. F. Gleason, who is no longer in the service.

B. T. Elkins has been transferred to the Navájo of the Pacific Coast Division. Louis Michael succeeds him on the Northland.

William Lillis has been transferred to the Portuguese Prince, an English vessel. G. Oliver, a tyro, takes Lillis' place on the Matura.

M. W. Grinnell and A. W. Mayer have been assigned as senior and junior, respectively, to the Massachusetts.

I. T. Barnes is now attached to the Bay State.

The Santa Catalina, Santa Cecilia, Santa Cruz, Santa Clara, Florence Luckenbach, Lewis Luckenbach, Hattie Luckenbach and Pleiades, of the Pacific Coast Division, have been transferred to this division. The operators attached to these ships, who will now come under the jurisdiction of this division, are as follows, their positions on the list corresponding with their ships in the order named: R. Ticknor, I. L. Church, George Gerson, J. E. Dickerson, P. S. Lewis, J. W. Russell, P. Harrison and F. Mousley.

C. E. Stevens is no longer on the Jamestown, having been replaced by J. Maresca. Stevens takes Maresca's place as junior on the Sarnia.

A. H. Lynch has relieved Sam Schneider as senior on the Brazos. R. Raggie fills the vacancy left on the Howick Hall.

J. P. Eckhardt has returned from a six months' cruise on the S. Y. Cassandra. The itinerary of the yacht included the Mediterranean, West Indies and Norway.

L. M. Burt has resigned from the service. J. M. Harrison takes his place as senior on the Parima.

R. Balzano replaces F. W. Rosenquist as senior on the El Rio.

F. L. Velten, a graduate of the Marconi School, is attached to the Cherokee as junior.

D. J. Surrency, who recently returned from a long trip on the Commewijne, has been assigned as senior operator on the City of St. Louis.

C. D. Riley has returned from a trip to Europe on the Antilla. The Antilla was captured by a British cruiser on her way to Copenhagen and escorted to an English port, where she was interned for more than two months.

H. B. West is now attached to the Antilla.

C. D. Riley is now senior on the Commewijne.

I. T. Carpenter is now on the J. L. Luckenbach, a one-man ship.

F. A. Klingenschmidt has returned to New York. The owner of the steam yacht Owera, to which Klingenschmidt had been attached, had expected to take a trip to the San Francisco Exposition, going through the Panama Canal. When the yacht reached the Canal, however, the plans were changed, much to Klingenschmidt's disappointment, and, after spending several months cruising about the West Indian islands the yacht returned north. Klingenschmidt has been assigned to the Algonquin as senior.

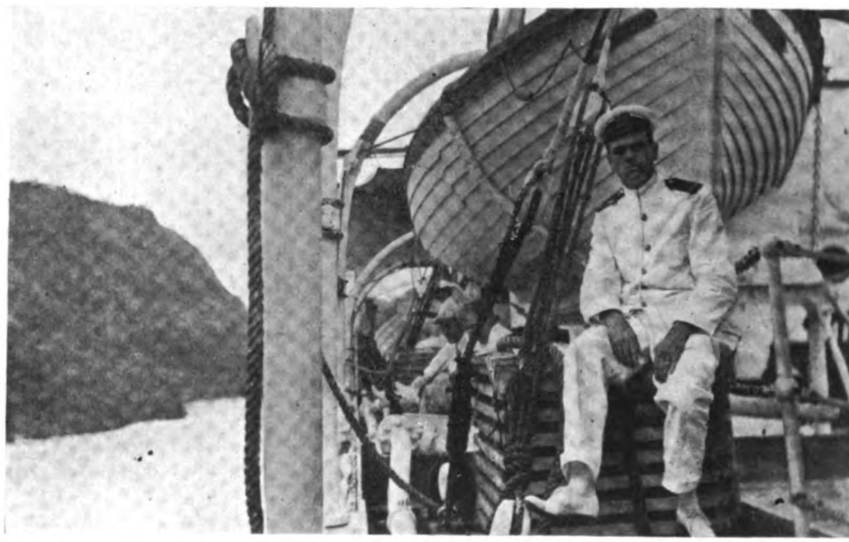
S. Tonner has resigned from the service. W. C. Thompson takes his place on the Radiant.

The details of A. Voightlander and W. E. Florence have been exchanged. Voightlander becoming senior on the North Star and Florence junior on the Morro Castle.

A. G. Berg is senior on the El Cid. The Esperanza, to which Berg had been attached for a year, has been laid up.

H. Bernhard succeeds K. McAlpine on the Kentra.

C. C. Langevin has returned from a trip around the world. Langevin left New York in December last on the City of Corinth. The itinerary of the vessel took her through the Panama Canal, across the Pacific to the Straits Settlements, to India, Egypt, and through the Suez Canal. Langevin says the Turks were shelling the Suez Canal when his ship was trying to get through. To protect the officers of the ship, the bridge was banked on all sides with bags of sand and earth. The members of the crew were ordered to keep below decks and in



E. N. Pickerill viewing the Panama Canal as the Kroonland steamed through the water-way. Pickerill is senior Marconi operator on the Kroonland

this way they managed to get through the Canal in safety. Langevin was transferred to the City of Delhi at Port Said, and made the remainder of the voyage on that vessel.

R. A. Merry is now junior on the Sabine.

R. J. Green has relieved H. V. Griffing on the W. B. Keene. Griffing is taking a vacation.

R. Wright, who made a voyage to Copenhagen on the City of Macon, has returned to the Great Lakes Division.

J. P. Callan was assigned to the Gulfstream at Baltimore, relieving F. G. Evans.

Sam Schneider and C. C. Langevin have been assigned to the Northland as senior and junior, respectively.

W. R. Schultz has resigned from the service. H. D. Copland takes his place on the Calvin Austin.

Nine graduates of the Marconi School have recently been assigned to steamers sailing out of New York.

Southern Division

A. Doehler has been temporarily assigned to the Powhatan as junior operator, vice operator Dudley, who has been detailed to the Cretan as senior operator.

R. Myers was recently transferred from the Suwanee to the tug Astral at Baltimore. His vacanacy on the Suwanee was filled by J. F. Larrimore.

H. McKiernan has been transferred from the Essex to the Parisian at Newport News, Va., as senior operator. H. Simons was assigned as junior.

O. E. Curtis has been assigned to the Dorchester as senior in place of J. B. Brannan. Curtis recently returned to the Marconi service after spending several months in the United States Coast Guard Service.

Sidney Giffin was recently assigned to the Caloria, of the Standard Oil Company, at Baltimore.

J. H. McCauley has been assigned to the Ontario as junior operator, vice J. F. Larrimore.

L. H. Gilpin was recently transferred from the Cretan to the Essex as junior operator, F. H. Crone having been promoted to senior on the latter vessel. The Cretan is now running between Philadelphia and Jacksonville via Savannah and the Suwanee has returned to Baltimore to take up her regular sailing between Baltimore and Jacksonville. Crone made several trips to Providence on the Parthian while the Essex was being repaired.

H. G. Hooper has been transferred from the Gloucester to the Essex as senior operator for one trip. The Gloucester is being overhauled at Baltimore.

Operator H. G. Helgeson was recently transferred from the Gloucester to the Atlantic, at Baltimore, relieving Operator L. C. Smith. The Atlantic steamed for Buenos Ayres, South America, thence to ports in Europe.

J. L. Brannan was recently transferred from the Dorchester to the Parthian as senior operator, D. D. Moore, a new man, being assigned as junior.

J. Greeley was recently assigned to the Cretan as senior operator.

Walter Osterloh, formerly junior operator on the Merrimack, has been reassigned to that ship after making several trips on the Dorchester to Boston and Providence.

Sewall P. Smith, formerly of the Francis Hanify, has been assigned to the Dorchester as junior operator.

Inspector E. M. Murray sailed from Baltimore on the Suwannee on June 15th to inspect the Savannah and Jacksonville stations.

R. B. Dailey, of the Cape Hatteras station, and Mrs. Dailey are on their vacation. Mr. and Mrs. Dailey visited the Baltimore and New York offices on their trip north. W. J. Phillips is working as relief operator at the Cape Hatteras station during the absence of Operator Dailey.

Inspector M. C. Morris is installing a set on the U. S. S. Melville at Philadelphia, which soon goes out on her official trial. The Melville is a naval floating machine shop.

Great Lakes Division

G. Mackwiz and F. Marshall, senior and junior, respectively, cleared Detroit for Buffalo, May 3rd, on the initial trip of the season made by the Eastern States.

Car Ferry M. & B. No. 1 recently dry-docked at Cleveland for a week. R. C. Hough took advantage of the prolonged stay to visit his home.

R. Garrie has replaced G. Keefe on the Georgia. Garrie comes from the Carolina.

E. Piersal has been assigned to the Alabama, vice H. M. Junker, who was placed in charge of the Virginia May 1st.

E. M. Tellefson is now on the Arizona.

S. R. Henry is now in charge on the Puritan, having replaced S. Hansen.

H. C. Rodd was temporarily assigned as manager at Ashtabula when that station opened for the season April 3rd.

C. D. Heinlen, who was employed as night operator at Duluth last season, has been assigned as second operator at the Cleveland station.

W. H. Jones, who was on night duty in Detroit last season, opened the Detroit station April 26th as manager, having as night man A. J. Main, who was on the Northland.

G. Commerford has been assigned to the City of Buffalo, vice F. Stehmeyer, who took the Lakeland on. May 29th The Lakeland is in dry dock at Detroit.

F. G. Siegel, who was manager at Detroit last season, is now first at Cleveland, vice E. A. Nicholas, who has left the service to enter the awning business in the latter city.

E. I. Deighan, who recently returned from a winter voyage on the briny deep, is full of reminiscences. Attempts to persuade him to write an article dealing with his voyages have not been successful, however.

A. J. Therriault, who performed such excellent service at Mackinac Island last season, again opened up the station May 28th.

The new steam yacht Nokomis, owned by H. E. Dodge, of Detroit, was placed in commission May 16th, with Charles W. Beals on board.

H. M. Junker has been placed in charge of the Virginia.

E. W. Schulthise of the Lakeland has been detailed to the Duluth on the second trick.

The City of Erie cleared Cleveland for Buffalo on her initial trip of the season, with G. Covey in charge. Covey sailed out of New Orleans during the winter months.

Pacific Coast Division

The Mongolia, with B. McLean in charge and E. S. Howard as assistant, topped the trans-Pacific newspaper sales record on March 16 last. We expected this mark would be shattered by the later arrivals carrying some of our old reliables, but it remained until McLean and his new assistant, P. S. Finnell of Chow Dorg fame, succeeded in raising the Mongolia's record by several hundred copies. Congratulations!

The following transfers and assignments have been made:

C. Trostle on the Aztec; C. M. Jackson, assistant on the Aroline; E. R. Fairley on Barge 91; L. C. Rayment on Barge 92; T. C. Eastman on the Beaver, as operator in charge; M. W. Michael on the Carlos; E. Diamond on the Centralia; J. F. Woods, assistant on the Congress; F. W. Brown on the Coronado; D. W. Kennedy on the Grace Dollar; I. W. Hubbard on the Governor, as assistant; A. P. Stone transferred to first on the George W. Elder, at Portland; J. J. Michelson transferred to assistant on the George W. Elder, at Portland; C. H. Rogatsky transferred to assistant on the Klamath; H. Bodin transferred to first on the F. A. Kilburn.

T. J. Welch relieved J. W. Russell as operator of the Lewis Luckenbach on June 4th. Russell has been granted a short leave of absence.

The Leelanaw, with Operator S. J. Morgan in charge, has been transferred to the New York Division.

G. S. Bennett has been transferred to the Manchuria as assistant.

H. C. Hax has been transferred to the Matsonia, as assistant.

B. T. Elkins relieved J. E. Dickerson, as operator in charge of the Navajo at New York, May 24th.

H. Long has been transferred to the Newport, as assistant.

M. A. Mears has been transferred to the Newport as assistant.

L. O. Marsteller has been transferred to the Pennsylvania as assistant.

F. Mousley has been transferred to the Pleiades.

J. H. Southard has been transferred to the President as first.

H. Dickow has been assigned as first operator on the San Juan.

J. W. Miller is now first on the Santa Clara.

J. E. Dickerson has been placed in charge of the Grace liner Santa Clara, bound from New York to San Francisco.

R. H. Brower and F. A. Lafferty are acting first and assistant on the Rose City.

H. Oxsen was assigned as operator in charge on the Yucatan for her voyage to Australia via Honolulu. On June 3 at eight o'clock in the evening her position was reported as 300 miles west of Honolulu.

B. H. Linden has been assigned to the San Juan as assistant.

G. F. Roberts, who for nearly two years has been wireless operator in charge and purser on the F. A. Kilburn, has joined the Francis Hanify, bound for Honolulu, via San Pedro.

Seattle Staff Changes

H. J. Scott has been detailed to the tug Oneonta.

E. J. Edmonds has been transferred from the Windber to the Admiral Watson as first operator. H. F. Wiehr took his place on the Windber.

C. A. Hohlbein, assistant on the Windber, has been transferred to the Admiral Evans.

J. E. Johnson has been transferred as first operator from the Queen to the President, with W. R. Rathbun as assistant.

O. Treadway has been transferred as first on the Admiral Watson to the Queen.

B. C. Springer, second operator on the Queen, is now on the Spokane.

H. W. Kelley, of the Seattle school, has been appointed second on the Queen.

F. M. Roy, of the President, and A. C. Berntswiller are first and second, respectively, on the Senator, the first boat to sail for Nome this season.

C. E. Williams, of the school, is second on the Spokane.

C. Thomas, second on the Governor, has resigned to take a position in the British military force in Canada.

C. E. Bence, station manager at Juneau, has started north on the Admiral Evans, after spending a vacation in San Francisco. He will relieve Gus Lang, who has been temporarily filling in at Juneau.

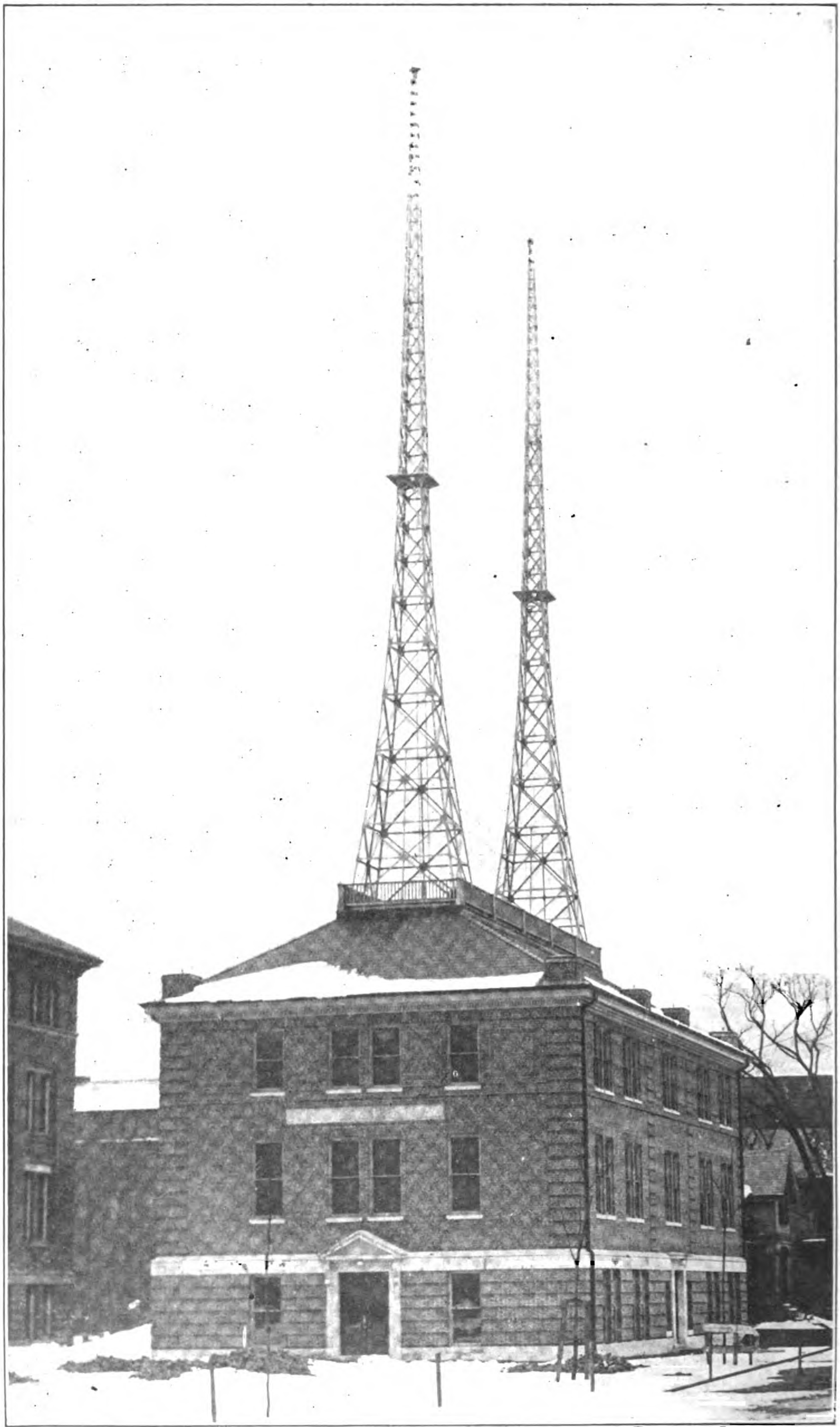
Friday Harbor station, one of the best-known Marconi stations on the Pacific Coast, has been permanently closed. Since the new Seattle station was established in the forty-two story L. C. Smith Building, the use of Friday Harbor as a relay station was no longer necessary. W. B. Wilson, station manager, is now taking a well deserved vacation, pending an appointment to another station.

R. S. Powell, of the Seattle construction force, is the father of a daughter, who was born in the latter part of May.

ITALY'S MESSAGE RULES

The Western Union Telegraph Company announces that the Italian Government, acting under Article 8 of the International Telegraph Convention and Article 17 of the Radio Telegraphic Convention, will accept on Italian lines and in Italian colonies only messages exclusively in plain language, (English or French); that they will not handle messages without texts; that service instructions, such as "reply paid," must be mentioned in full in the French language and not in abbreviations admitted by the convention.

Inquiries concerning messages sent or received are not admitted. All messages are subject to censorship, and therefore at sender's risk. All Italian radio coast stations and colonial stations are closed for private service.



The new radio laboratory at Harvard University

Queries Answered

Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of an individual can be answered. To receive attention these rules must be rigidly observed.

Positively no Questions Answered by Mail

H. V. R., Jamaica, N. Y., writes:

Ques.—(1) I have an aerial composed of five No. 14 wires, 40 feet in length, spaced 1½ feet apart. If I space the wires 3 feet apart, will it increase the intensity of the signals?

Ans.—(1) If you refer to signals received, there will be little if any increase in strength.

Ques.—(2) Can a 4,000-meter loading coil be employed in connection with a 3,000-meter receiving tuner?

Ans.—(2) Yes, if another loading coil is inserted in series with the secondary winding to maintain conditions of resonance.

Ques.—(3) Is the New York Herald wireless station in operation, and if so, at what time?

Ans.—(3) This station is in communication with vessels at irregular intervals. Press matter is sent regularly at 10:15 P. M. and at 3:15 A. M.

Ques.—(4) Has the size of the earth wire leading to a water pipe any effect on the intensity of signals received?

Ans.—(4) It will have no effect whatsoever provided the wire is at least a No. 18 B. & S. gauge. For transmission purposes the earth connection should be as large as possible.

Ques.—(5) Please give my receiving range with the following instruments: Aerial as described, 3,000-meter loose coupler, silicon detector, small condenser and Brandes head telephones of 2,800 ohms resistance.

Ans.—(5) Your daylight receiving range is about 100 miles; night range about 500 miles.

* * *

R. J. F., Southampton, N. Y., writes:

Ques.—Please tell me how far I can transmit with a ½ k.w. transformer, rotary spark gap revolving at a speed of 2,400 R.P.M., a condenser comprising 8 plates 6 x 8. I use 12 battery cells as a source of energy. My aerial is 60 feet in height by 130 feet in length, composed of 6 copper wires hung on 12-foot spreaders. I have a friend who has a wireless station, but I cannot get in communication with him. In fact, he advises that he does not hear me at all, and I fail to hear him; however, I can receive from other stations. Please tell me what the trouble is.

Ans.—If you had given the distance from your station to your friend's house, and also enclosed a diagram of the connections employed we might answer the query more definitely. Your aerial has a natural wave-length of about 350 meters, which, of course, does not comply with the government law. In fact, this aerial is too long to be operated on a wave-length of 200 meters, and you should therefore erect one of smaller dimensions for transmission purposes. The capacity of your sending condenser is about .004 mfd., which requires several turns at the primary winding of your oscillation transformer to attain a wave-length of 200 meters. We do not understand how you operate a ½ k.w. transformer with batteries. Do you mean that you have an induction coil, or do you actually manipulate the transformer in connection with an interrupter?

* * *

K. B., Gastonia, N. C., inquires:

Ques.—(1) At my receiving station I have experienced at times a peculiar, sharp, buzzing noise, which resembles a 60-cycle current, and, in fact, is much similar to the noise heard in the ordinary telephone receiver when central accidentally rings in your ear. The noise is more or less intermittent, sometimes lasting a day and two nights continuously, and again only occurring at intervals during one night. It is seldom very loud during the daytime. The energy is slightly tunable, being received with the greatest strength at about 2,500 meters. When at its worst I can place my receiver at arm's length on the table and still hear the diaphragms buzzing. No matter what changes I make in the connections of the apparatus they do not have any effect upon the noise without also reducing the wireless telegraph signals. By disconnecting the ground wire the volume of the noise is diminished about one-half. If, however, the ground is reconnected the noise immediately occurs; or, if the ground is connected and the aerial disconnected, the noise is again considerably reduced. I hear a noise of similar note or tone in the ordinary speaking telephone between the time I take down my receiver until central answers. The superintendent of lighting for this city has attempted to find an explanation of the matter but without success. Any advice or suggestions will be greatly appreciated.

Ans.—(1) This noise is undoubtedly caused by induction from arc lights or alternating current circuits in your vicinity. If the tone is similar to that produced by central ringing

into your ear it may be due to leakage from alternating current power lines, accompanied by slight sparking, which, of course, will be heard in any wireless telegraph aerial in the vicinity. If there are alternating currents light leads running to your house, we suggest that you shunt two condensers connected in series across the line and ground them at the middle point. As we understand from your communication, the trouble is more pronounced at night time, and it may be that certain arc lights in your city radiate energy of slightly damped characteristics, which, of course, will set up inductive noises in your receivers.

If your aerial is parallel to the power line we suggest that if possible you swing the former at right angles, thereby receiving the least inductive effect.

Ques.—(2) I have a 6-wire inverted L aerial 142 feet in length by 88 feet in height, the wires being 2½ feet apart. The lead-in wire is about 80 feet in length and the ground wire about 15 feet. Please tell me my wave-length.

Ans.—(2) The natural wave-length of your aerial is about 420 meters.

Ques.—(3) Since Sayville has been using the 4,800-meter wave, should I be able to hear their signals by simply "loading" to their wave-length, or is special apparatus required other than loading coils? I formerly heard this station quite plainly on 2,800 meters.

Ans.—(3) The signals of this station can be attuned to by means of a loading coil, but a similar loading coil should be connected in the series of the secondary winding to maintain conditions of resonance. We do not mean to infer that these coils have similar dimensions because, owing to the different values of capacity in the circuit, their dimensions must naturally be different. Please take into consideration that during a certain period at night time the Sayville station employs undamped oscillations, and you will therefore not be able to hear its signals without apparatus peculiarly fitted for the reception of this form of energy.

* * *

L. C., Wildwood, N. J., asks:

Ques.—(1) What is the wave-length of my aerial, which is 200 feet in length, 30 feet in height on one end and 40 feet in height on the other? The lead-in wire is 35 feet in length, while the ground wire is 10 feet in length. The wires are spaced 18 inches and are of No. 14 B. & S. aluminum.

Ans.—(1) The natural period of your antenna is approximately 360 meters.

Ques.—(2) What does the term "microfarads capacity" mean? Does the variable condenser of a receiving set need to have the same capacity as the antenna?

Ans.—(2) The capacity of an electrical conductor is its ability to store up energy in the form of electrostatic lines of force. The unit of capacity is the farad, which is too large for practical purposes. The microfarad, which represents a millionth of a farad, has therefore been adopted. The capacity of the average amateur's aerial is rather small—not over 0.0004 mfd. There is no distinct connection between the capacity of the variable condenser of a receiving set and that of the aerial, but of course for adjustment to certain wave-lengths the variable condenser must have a certain definite range of capacity. To familiarize yourself with the receiving apparatus we suggest that you note particularly the articles appearing in the series, "How to Conduct a Radio Club," in the April and May, 1915, issues of The Wireless Age.

Ques.—(3) Please tell me approximately my receiving range, day and night. My loading coil is 12 inches in length by 2½ inches in diameter, wound with No. 26 black enamel wire. The loose-coupler is 5 inches by 9 inches for the primary winding and is covered with No. 22 black enamel wire. The secondary winding is 9 inches by 4¼ inches, wound with No. 36 black enamel wire. There are 16 taps on the coil of the secondary winding. I do not slide the secondary winding in and out of the primary winding as the results are about the same regardless of their relative position. I use an E. I. Company fixed condenser and a catwhisker silicon detector. My telephones are of the Brandes trans-Atlantic type. As an earth connection I use both water and gas pipes.

Ans.—(3) As we do not know the nature of the stations you expect to receive from, it is difficult to give the receiving range. Your receiving tuner is too large for the reception of amateur signals or signals from commercial stations operating on wave-lengths between 600 and 2,000 meters. In fact, when this tuner is adjusted to the shorter wave-lengths the "dead ends" must absorb considerable energy. That apparently no difference is noted in the relative positions of the primary and secondary windings may be accounted for by the fact that this tuner is ill-designed for the wave-lengths of stations in your vicinity.

Ques.—(4) How far can I transmit on the same aerial, using 110 volts alternating current passed through an interrupter similar to that made by the E. I. Company? The current is sent through a 2-inch spark coil. As a condenser I use an old candy jar with tinfoil inside and outside. My spark gap is fixed. I also use a home-made oscillation transformer.

Ans.—(4) Using the aerial as described, the emitted wave will be far above that allowed by the government restrictions, and it will therefore be necessary for you to erect a shorter aerial to comply with the law. Again, it will be difficult to place this small condenser and set in resonance with the antenna circuit. You will probably obtain the best results by simply connecting the spark gap of your set in series with the antenna circuit. With this connection your set should be heard at a distance of 15 miles.

* * *

A. C. S., Lawrence, Mass.:

Ques.—(1) Please give my receiving radius, day and night, with the following instruments: The aerial is 65 feet in length by 30 feet in height, composed of 6 strands of copper wire, spaced 27 inches. My receiving tuner is of the

inductively coupled type, having a range up to 2,500 meters. The remainder of the equipment comprises a Brandes 2,000-ohm head set, silicon and perikon detectors and variable condensers.

Ans.—(1) Your receiving range by day is approximately 150 miles; by night you should receive from 800 to 1,000 miles during the winter months of the year.

Ques.—(2) What is the natural wave-length and capacity of this aerial?

Ans.—(2) The natural wave-length is about 188 meters, and the capacity about .00028 mfd.

Ques.—(3) Should I be able to hear the Key West Naval station? I can hear Arlington (Va.) in the daytime almost as well as at night.

Ans.—(3) You should hear the Key West station at night time during the winter months.

Ques.—(4) What are the wave-length and kilowatts employed by the Key West naval station?

Ans.—(4) Power, 25 k.w.; wave-length, 1,600 meters.

Ques.—(5) When will the new station at Chelsea, Mass., begin operations?

Ans.—(5) The date has not been definitely decided upon. It is not yet completed.

* * *

B. C. R., St. Johnsbury Center, Vt., writes:

Ques.—(1) I use two aerials which have dimensions as follows: The first is 475 feet in length by 75 feet in height, with a lead-in of 60 feet, comprising 2 wires; the second is 100 feet in length, 60 feet in height, with a lead-in of 40 feet, comprising 4 wires. Please advise as to the wave-length of each, and approximate capacity.

Ans.—(1) The wave-length of the longer aerial is between 750 and 800 meters, and the capacity about .0015 mfd. The wave-length of the second aerial is 300 meters and the capacity approximately .0004 mfd.

Ques.—(2) If I can hear NAA at noon at a distance of 470 miles, how far should I be able to receive at night, using a galena detector for the work?

Ans.—(2) Your night range is about 1,500 miles during the more favorable months of the year.

Ques.—(3) What make of telephone receiver is used in the Marconi service, and what is its value of resistance?

Ans.—(3) Telephone receivers of various makes and design are used. The majority, however, are furnished by the Electrical Industries Manufacturing Company, New York.

* * *

R. S., Sunbury, Pa.:

After careful observation of your diagram we advise that for general receiving work the aerial shown in diagram No. 2 is preferable.

* * *

N. L., East Orange, N. J.:

Ques.—(1) Please tell me the wave-length and capacity of my aerial which consists of 3 wires, 7 strands, No. 22 copper wire. Each wire is 115 feet in length and wires are spaced 4½ feet apart. At the highest end the aerial has a height of 35 feet from the ground and 32 feet at the other end. The lead-in is composed of 3 wires, each 10 feet in length.

Ans.—(1) The natural wave-length of this aerial is about 270 meters and the capacity approximately .00042 mfd.

Ques.—(2) Please tell me if it will be possible to do long distance work in the evening with this aerial in connection with the following instruments: 2,500-meter loose coupler, 2 Blitzen variable condensers; Murdock telephone condensers, Brandes Superior head telephones and galena detector. What will be the approximate night and day range?

Ans.—(2) In the daytime you should be able to hear signals from Arlington, while at night, during the more favorable months of the year, your range is from 1,200 to 1,500 miles.

Ques.—(3) Approximately how much wire (No. 22 D.C.C.) would be needed in making a loading coil, which is to be wound on a tube 5¼ inches in diameter to attain a wave-length of 5,000 meters? The coil is to be used with the aerial and instruments mentioned. What should be the length of the tube?

Ans.—(3) The tube should be about 10 inches in length and wound closely with No. 20 D.C.C. wire. A loading coil should also be connected in series with the secondary winding or a condenser of larger capacity connected in shunt to this winding, in order to maintain conditions of resonance.

* * *

H. A. D., Poughkeepsie, N. Y.:

The call letters referred to in your first query are unknown. We have no record of the existence of such stations.

Ques.—(2) Please give me the formula to calculate the capacity for a glass plate condenser.

Ans.—(2) $C = \dfrac{Ka\ 2248}{T \times 10^{10}}$ mfds.

Where C equals the capacity of microfarads;

K equals the dielectric constant of glass, which varies from 6 to 9;

T equals the thickness of the glass in inches.

The following formula covers a condenser having air as the dielectric, namely,

$$C = \frac{A^2}{4\pi T \times 900{,}000}$$

Where C equals the capacity in microfarads;

A equals the area of the dielectric covered by coatings in square centimeters;

T equals the thickness of the dielectric in centimeters.

Ques.—(3) What is the capacity of a glass plate covered with tinfoil 6 inches × 8 inches, the glass having a thickness of 1/16 of an inch?

Ans.—(3) The capacity of this plate is about .001 mfd.

Ques.—(4) Is there a formula which will

enable one to find the size of a condenser to be employed with a certain size of transformer? I have such a formula, but it does not seem possible that it can be correct. Apparently it gives too large results. My formula is as follows:

$$C = \frac{1000 \times \text{power in k.w.}}{N\ V^2}$$

Where C equals the capacity in farads;
N equals the frequency of the alternator;
V equals the secondary voltage.

As an example: For a ¼ k.w. set having a primary voltage of 110 and a frequency of 60 cycles, also a secondary voltage of 13,000, the formula works out as follows, namely,

$$C = \frac{1000 \times .25}{60 \times 13000^2} = 0.0000000246 \text{ or } .0246 \text{ mfd.}$$

This seems too large for a transmitter of this size.

Ans.—(4) The formula you give is quite correct as well as the result. Please note that this formula is based upon the assumption of a synchronous spark discharge, namely, one spark for each alternation of charging current. You will now observe why it is desirable that an amateur's transformer should have a fairly high voltage, say about 18,000 volts. In this manner a greater amount of primary current can be used.

A similar formula simplified is as follows:

$$C = \frac{W}{V^2 N}$$

Where C equals the capacity in microfarads;
W equals the watts to be consumed;
V equals the kilo-volts at the secondary of the transformer;
N equals the cycle frequency.

Amateur apparatus ordinarily does not give synchronous spark discharges; therefore the formula is only approximately correct. Please observe also that these formulas are based upon the maximum voltage per cycle of the charging current and not on the R.M.S. voltage. For instance, if the R.M.S. value of the voltage is about 13,000, then the maximum value will be somewhere in the vicinity of 18,000.

* * *

A. B., Lorain, O., asks:

Ques.—(1) Is there any method by which I can fix a ¾ k.w. transformer which has three primary taps, giving ¼, ½ and ¾ k.w. respectively, so that on the ¼ k.w. tap it will not pull down the lights in the house?

Ans.—(1) Not being familiar with the design of this transformer, it is difficult to give a concise reply. You might insert a reactance coil in series with the primary winding or try an alteration of the condenser capacity at the secondary winding. The closed core transformer of the magnetic leakage type gives the least trouble in this respect.

Ques.—(2) Will you kindly advise what mineral is the most sensitive to be used in a cat whisker detector holder, and the prices?

Ans.—(2) Tests indicate that the cerusite detector is the most sensitive of all. These detectors can be purchased from the Marconi Company at a price of $50 each. The crystals are not sold independently of the holder.

* * *

E. J. D., Cambridge, Mass., writes:

Ques.—(1) Will you kindly send me a catalog of your electrical books as I would like something which will aid me to prepare for a commercial examination.

Ans.—(1) Please note the advertisement appearing each month in The Wireless Age; a number of good books on wireless telegraphy may be purchased from the Book Department of the Marconi Publishing Corporation, 450 Fourth Avenue. A book published under the direction of The Wireless Age will shortly appear, giving just the information you desire.

Ques.—(2) Is it possible to purchase the bulb only for an audion set?

Ans.—(2) Communicate with the Cost and Sales Department of the Marconi Wireless Telegraph Company of America, 233 Broadway. The price of the vacuum valve detector is $5 each.

* * *

F. M. C., Dallas, Tex., inquires:

Ques.—(1) What is the natural wave-length of an inclined aerial, composed of 4 No. 14 copper wires spaced two feet apart? It is 73 feet in height at one end and 12 feet at the other end; the length is 64 feet. The total length of the instrument is 90 feet. Is this an efficient aerial for a 1 k.w. set tuned to a wave-length of 200 meters? What distance could I expect from it?

Ans.—(1) The natural wave-length of this aerial is approximately 190 meters. It is a little too long for operation on a wave-length of 200 meters on account of the fact that the secondary winding of the oscillation transformer must be connected in series. The additional inductance of this winding will raise the wave-length to a value above 200 meters, and of course may be reduced by the insertion of a short wave condenser. A condenser for this purpose may consist of a single sheet of glass, 8 x 8 inches, covered with tin-foil, 6 x 6 inches. It is doubtful whether your set will consume 1 k.w. on a wave-length of 200 meters because the power consumption is limited by the capacity of the condenser. The condenser cannot have a capacity value of more than .01 mfd. The maximum transmitting distance will be from 25 to 35 miles.

Ques.—(2) What is the wave-length of an aerial composed of 6 No. 12 copper wires spaced 3 feet apart; the horizontal portion is 80 feet in height at one end, 73 feet in height at the other. It is 145 feet in length. The vertical portion is 70 feet in length, and the total length of the instrument is 240 feet. Is this an efficient transmitting aerial for a 1 k.w. set tuned to a wave-length of 425 meters? Furthermore, what distance could I expect?

Ans.—(2) The natural wave-length of this aerial is about 400 meters, which is just a little too long for operation on a wave-length of 425 meters. This aerial should be reduced in

dimensions so that the natural wave-length will be about 385 meters. This reduction will allow a certain amount of inductance to be connected in series with the secondary winding to attain a wave-length of 425 meters. Are you sure that the government authorities will allow you to operate your set on this wave-length? You should ask the inspector in your district whether this will be possible.

Ques.—(3) What reading of amperes should be expected in each of the aerials referred to?

Ans.—(3) On a wave-length of 200 meters you need not expect a current value of more than 1½ amperes, but on a wave-length of 425 meters your set should, if properly adjusted, give a current reading of, say, 4 or 4½ amperes.

* * *

R. F., Molalla, Ore.:

Ans.—(1) We are glad to know that this department has aided you in solving your wireless telegraph problems. If you desire instruction at a Marconi School, communicate with the Superintendent of the Pacific Coast Division, Merchants Exchange Building, San Francisco, Cal.

Ques.—(2) On what wave-length does N.P.F., Cape Blanco, Ore., send?

Ans.—(2) This station is listed as employing 2 wave-lengths, one of 300 meters and the other 600 meters. The range is supposed to be 100 miles.

Ques.—(3) Is it possible for me to construct a receiving outfit to hear signals at a distance of 3,000 miles at nighttime?

Ans.—(3) Yes. Read the article, "How to Conduct a Radio Club," which appeared in the January, 1914, issue of THE WIRELESS AGE.

Ques.—(4) I have an aerial consisting of 4 strands of No. 16 aluminum wire. It is 125 feet in length and 75 feet in height at one end and 50 feet at the other. What is the natural wave-length?

Ans.—(4) The natural wave-length of this aerial is about 350 meters.

We are not able to give definite advice why your receiving set does not work. We should know the complete details of the set and see a wiring diagram of the connections. A number of circuit diagrams applicable to your purposes have appeared in previous issues of THE WIRELESS AGE.

Operators are instructed in the Marconi service between the ages of 18 to 25 years.

* * *

R. E. M., Stanislaus, Cal., says:

Ques.—(1) Referring to the January, 1914, issue of THE WIRELESS AGE, on page 325 in the article entitled "Elementary Engineering Mathematics," I should like to ask if equation 3 is correct. The only way I can obtain the answer of 3,230 centimeters is to change the 10^{-5} to 10^5, then it checks within 1 centimeter. Also it says immediately below equation 3 that "This will be the equivalent of a plate 2.27 feet square." Is this correct? Any additional information will be greatly appreciated.

Ans.—(1) This is a typographical error. It should read 10^5. You will obtain the value, 2.27 feet, by extracting the square root of 3,230 and converting the result from centimeters to feet. One inch = 2.54 centimeters.

Ques.—(2) I should also like to have a formula sufficiently accurate for calculation of the inductance and capacity of an aerial of the inverted L type, the average height, the length of flat top, the length of the vertical parts, the number of wires and their distance apart, all being known quantities. The aerial under consideration is to be 150 feet in height at the open end, and 75 feet in height at the end where the lead-in is tapped on. So far the only data I have been able to obtain are for a single wire aerial suspended either vertically or horizontally.

Ans.—(2) For a discussion of this subject we refer you to the article by Dr. Cohen in The Electrician for February, 1913.

* * *

A. C. M., Seattle, Wash., inquires:

Ques.—Please tell me the wave-length of the Marconi station at Ketchikan, Alaska, and the size of the set installed there at the present time.

Ans.—A new installation has just been made and the wave-lengths to be adopted have not been definitely decided upon.

* * *

C. R., Brooklyn, N. Y., inquires:

Ques.—(1) Is it the length of the wire or the number of strands in the wire of an aerial that causes the signals to come in louder and from a greater distance?

Ans.—(1) Many variable factors enter into this case. High power transmitting stations generally emit waves of great length and consequently the receiving aerial must have considerable length to be in resonance. For the reception of amateur signals the aerial should be of small dimensions, but for the reception of the longer wave-lengths increased dimensions will give increased strength of signals.

* * *

F. H., Portland, Ore., writes:

Ques.—(1) I am just entering the amateur field and wish to advise you that I know nothing about wireless telegraphy. I borrowed a copy of THE WIRELESS AGE from a friend and observed that you answer questions, so I thought I would write for advice as to the kind of apparatus to obtain for my first experiment. We are located in a low place so that I believe I require a high aerial in order to obtain results. Please advise me as to the cheapest equipment I can purchase suitable for my needs. Would the fact that there are two cherry trees about our house prevent the reception of signals?

I expect to be a subscriber to your magazine soon.

Ans.—(1) The article entitled "How to Conduct a Radio Club" appearing in the June, 1915, issue of THE WIRELESS AGE will give you the information you want. The cherry trees will have a slight adverse effect on your receiving range. It will not be great enough to be concerned over, however.

M. A., Philadelphia, inquires:

Ques.—(1) What is the wave-length of my aerial which consists of 4 wires spaced 3 feet apart, 65 feet in length by 50 feet in height at one end and 70 feet in height at the other end? The lead-in is taken off the middle.

Ans.—(1) The wave-length of this aerial is about 230 meters.

Ans.—(2) With the apparatus you describe you should be able to hear the signals from the naval station at Colon, Panama, during the nighttime. It is indeed remarkable that you were able to hear the signals from the station in Florida you refer to in the daytime. If you are positive of this result you may consider your receiving apparatus as extremely sensitive.

Ques.—(3) What wave-length does the naval station at Colon, Panama, send on?

Ans.—(3) Three wave-lengths are employed—300, 600 and 1,800 meters.

Ques.—(4) When the Brooklyn Navy Yard transmits on a wave-length of 1,000 meters I can hear that station almost as loud on a wave-length of 2,000 meters. Can you explain this?

Ans.—(4) This effect is due to forced oscillations in the receiving circuit and it hints at ill design of your receiving tuner. You will find upon investigation that, even though your receiving set is apparently set at a wave-length of 2,000 meters, there are some complicated phenomena connected with the coupling, etc., which, in reality, place your receiving tuner in effective resonance with the 1,000-meter signals.

Ques.—(5) Do the Delaware, Lackawanna & Western railroad wireless stations work at nighttime, and, if so, on what wave-lengths?

Ans.—(5) The station in New York City works in the daytime only between the hours of 9 A. M. and 5 P. M. This station is in communication with Binghamton and Buffalo. The wave-length of the Hoboken (N. J.) station is 2,160 meters, that of the station at Binghamton 1,800 meters, and that of the station at Scranton about 2,250 meters.

* * *

C. A. H., New Berlin, N. Y., writes:

Ques.—(1) I have a T aerial 70 feet in height and 160 feet in length, consisting of four wires spaced 4 feet apart. Will the efficiency of my aerial be increased by changing it to the inverted L type?

Ans.—(1) As a receiving aerial it will make little difference whether you employ the T or inverted L. The natural wave-length of your aerial is about 450 meters and for the reception of amateur signals it is likely that better results will be obtained with the T type of aerial rather than the inverted L. For the longer wave-lengths, such as are employed by Cape Cod, Arlington and Sayville, the inverted L type is preferable on account of the longer natural wave-length.

Ques.—(2) Should I take my lead-in wires from the end of the aerial nearest to the station I desire to receive from, or in the opposite direction?

Ans.—(2) The lead-in wires should be taken off the end of the flat top nearest to the station from which it is desired to receive.

* * *

A. L. M., Calhoun, Ky., writes:

Ques.—What have you relating to the construction and operation of a receiving set designed particularly for receiving time signals by wireless?

Ans.—No articles devoted particularly to this subject have been published. Data were given in the January, 1914, issue of The Wireless Age covering a number of receiving tuners having a definite range of wave-lengths. Additional data were given in the February, 1915, issue of The Wireless Age, in which receiving coils of definite wave-lengths were described.

* * *

L. B. W., Angola, Ind., writes:

Ques.—(1) I have a coil rated at a 3-inch spark. The primary comprises two layers of No. 14 copper wire; the core is 2 inches in diameter. The secondary has 14 sections, each being 6 inches in diameter by 3/8 of an inch in thickness. Should not this coil give more than a 3-inch spark with batteries as the primary power?

Ans.—(1) The rating as given is quite correct for a coil of these dimensions.

Ques.—(2) Could my coil be safely operated on a 110-volt, 60-cycle alternating current circuit without an interruptor? If so, how?

Ans.—(2) Your coil is not suited for operation on 60-cycle current and experiments should be avoided.

Ques.—(3) At what power would my coil be rated in kilowatts and what transmitting range could be expected on an aerial 100 feet in length by 40 feet in height, consisting of two wires?

Ans.—(3) The maximum range is about 15 miles. The energy consumption of the coil will be about 75 watts.

Ques.—(4) Can you tell me why the signals from Arlington are louder at my station in daytime than at night?

Ans.—(4) We can give no definite reason for this effect.

Ans.—(5) The peculiar signals which you hear from Arlington are code messages being dispatched to the various vessels of the United States naval fleet.

* * *

F. E. H., New York, writes:

Ques.—(1) Will you kindly give me specifications and directions for the construction of a 1 k.w. open core transformer to be operated on a 50-cycle, 110 volts alternating current circuit, without an interruptor of any kind?

Ans.—(1) The following data are applicable to a transformer of this construction: The primary core is made of No. 30 iron wire and is 3 inches in diameter by 25 inches in length. It is then covered with five layers of Empire cloth and wound with two layers of No. 10 D.C.C. wire. The secondary winding has 38 pancakes; each is 1/8 of an inch in thickness and has 1,125 turns of No. 30 S.S.C. wire. The secondary winding is insulated from the

primary winding by a hard rubber tube ¼ of an inch in thickness.

Ques.—(2) Please tell me how far the transmitting set referred to will carry in connection with a flat top aerial 90 feet in length by 80 feet in height, consisting of four strands of No. 22 wire; wires spaced 2 feet apart?

Ans.—(2) The wave-length of the aerial is about 320 meters. It will be raised considerably by the insertion of an oscillation transformer. Inasmuch as the emitted wave will not comply with the law, you should erect an aerial of decreased dimensions having a natural wave-length of about 160 or 165 meters. If, however, you are allowed to operate this transmitting set in connection with the larger aerial, no difficulty should be experienced in attaining a distance of from 40 to 60 miles.

* * *

F. F., Olympia, Wash., inquires:

Ques.—(1) What is the most efficient length and height of an aerial to be used for both transmitting and receiving purposes? It is to cover a range in receiving from 200 to 2,500 meters by means of a series variable condenser and for the longer wave-lengths will have a condenser connected in shunt. It is proposed to use this aerial for transmission purposes by the insertion of a series condenser. The flat top portion is to have a distance of not more than 60 feet above the surface of the earth.

Ans.—(1) The operation of an amateur transmitting aerial with a short wave condenser connected in series is not entirely satisfactory. The maximum wave-length which your aerial may have for both purposes is 200 meters. When the transmitting set is connected to it the emitted wave without the series condensers will be raised to a value above 200 meters, but can be reduced to that value by the insertion of a condenser of proper capacity. An aerial having a natural period of 200 meters is not wholly suited to the reception of 2,500-meter signals, but fair results can be obtained by efficient design of receiving apparatus. Inasmuch as the natural period of your aerial is 200 meters the insertion of the primary winding of the receiving tuner in series will raise it to a value above that amount. You, therefore, require for the reception of amateur signals a variable condenser of a fair range to be connected in series with that circuit for reduction of wave-length. We do not advise the erection of an aerial of greater wave-length than that given.

Ques.—(2) What should be the size of the glass and foil for the series condenser when transmitting?

Ans.—(2) The condenser should consist of two plates of glass 8 x 8 inches, ⅛ of an inch thick, covered with foil 6 x 6 inches. The plates should be connected in series.

Ques.—(3) How many wires should the flat top aerial contain?

Ans.—(3) Four wires spaced 2 feet apart.

* * *

F. H., Newark, N. J., asks:

Ques.—(1) What is the law for the amount of power to be used in the primary winding to cover a certain distance?

Ans.—(1) If you refer to the United States restrictions, the following applies: Amateur stations may employ up to 1 k.w. of energy in their transmitting sets, provided they are more than five miles from a naval station. When within five miles of a naval station the transformer input should not exceed ½ k.w.

Ques.—(2) Describe how you can calculate whether your wave-length is greater than 200 meters.

Ans.—(2) This observation is preferably made by means of a calibrated wave-meter.

Ques.—(3) Can you give a simple explanation of how the sending and receiving sets work?

Ans.—(3) We refer you to the articles on "How to Conduct a Radio Club" published in THE WIRELESS AGE for April and May, 1915. Note also the article in the series on "How to Conduct a Radio Club," published in the June, 1915, issue of THE WIRELESS AGE. This gives general information for those new in the amateur field.

Ques.—(4) I have a 2-inch spark coil. About how many watts will it consume?

Ans.—(4) About 30 watts.

Ques.—(5) When I send with this coil, my galena detector is knocked out of adjustment. How can this be avoided?

Ans.—(5) The receiving detector should be disconnected from the receiving circuits and short-circuited with a small switch during the periods of transmission; or, if desired, a condenser of 5 microfarads capacity may be connected around the detector during the periods of transmission.

* * *

L. F. S., Los Angeles, Cal., asks:

Ques.—(1) Please give full data for the construction of a 1 k.w. open core transformer.

Ans.—(1) See the answer to the inquiry of F. E. H. in this issue.

Ques.—(2) What causes the fading out of long distance signals?

Ans.—(2) This matter has never been definitely settled. Various theories have been advanced, such as the absorption of reflection and refraction of the wave energy. In many cases the fading out of signals has been attributed to poor design of the transmitting apparatus. This assertion, however, has been in the main disproven. See pages 112 to 115 in "Text Book on Wireless Telegraphy," by Rupert Stanley.

Ques.—(3) Is it not unlawful to use the signal . . . —— instead of —— . . . which is supposed to take the place of the word "from"?

Ans.—(3) The rules of the International London Radio Telegraphic Convention make no stipulation for the use of the first signal, authorizing the second one only.

* * *

R. F., Detroit, Mich.

Ans.—A condenser comprising plates of the size you suggest should have a final and total capacity of .01 mfd. for operation on a wave-length of 200 meters. Each plate, as you de-

scribe it, will have a capacity of .0004 mfd., and you should therefore connect twenty-five of these plates in parallel to reach the desired wave-length.

With a condenser of this capacity the primary winding of your oscillation transformer need not consist of more than two turns of copper ribbon having an inside diameter of about 8½ inches. The secondary winding may have from 10 to 12 turns, depending, of course, upon the size of the aerial with which it is to be employed. The secondary voltage of the transformer you describe is a little low for amateurs' work; an amateur's transformer preferably has a secondary voltage of from 15,000 to 18,000 volts.

A rotary spark gap suitable for your needs should have 10 stationary electrodes and 2 movable; that is to say, 5 on each side of the complete circle.

* * *

C. G. H., Newark, Ohio, inquires:

Ques.—(1) Is the Key West, Fla., station on the Keys or on the Florida mainland?

Ans.—(1) It is situated on the Keys at a considerable distance from the mainland, about 40 or 45 miles.

Ques.—(2) I have a 30,000-volt transmission line at right angles to my aerial and at a distance of about 100 feet. I have heard of placing two extra outside wires in the aerial and grounding to certain apparatus. Can you give me information regarding the nature of this equipment? The inductive noises from this transmission line interfere considerably.

Ans.—(2) An article covering this particular subject appeared in the series on "How to Conduct a Radio Club" in the July, 1914, issue of The Wireless Age. In the system described a second aerial is erected near to the transmission line and earthed through a second primary winding of the receiving tuner. This primary winding is so constructed and connected up that it is in magnetic opposition to the ordinary winding connected to the aerial. In this manner the inductive influences from a transmission line may be decreased considerably.

Ques.—(3) Are the stations recently opened by the Marconi Company at Belmar in operation? What wave-length and what time do they work?

Ans.—(3) Owing to the fact that the corresponding stations in England have been taken over by the British Admiralty, these stations are not yet open for commercial use.

* * *

K. B. W., Carroll, Ill.:

Ans.—Regarding your communication relative to harmonic tuning: The harmonics of a transmitting set do not carry to any appreciable distance. While they may, to some extent, exist, the radiated energy is extremely feeble.

An antenna having a natural wave-length of 500 meters is, as you already understand, entirely unsuitable for work on 200 meters, and it is preferable therefore to erect two aerials, one having a wave-length of 500 meters to be used for the reception of long wave-length signals, and the second one to have a maximum receiving wave-length of not more than 600 meters.

For the pure reception of amateur signals the receiving antenna should have a natural period of not more than 180 meters. An antenna having linear dimensions of 60 feet and a height of 40 feet will have a natural wave-length of about this value.

Numerous attempts have been made to receive signals from a distant station by adjusting the antenna circuit to a definite wave-length and then the local detector circuit to some sub-multiple of the natural frequency. In some cases, when the receiving station is nearby to the transmitting station, signals are received, but they are not particularly due to harmonic tuning. They are simply the result of forced oscillations, owing to the closeness of the transmitting apparatus.

When an amateur receives 200-meter signals on a wave-length adjustment of 1,200 meters, the results are probably caused by ill design of the receiving tuner which results in the complicated phenomena that may give some portion of the circuit a natural wave-length of 200 meters, resulting in the reception of the signals. This, however, cannot be the most efficient condition of the circuit and by proper re-design of the antenna system and associated receiving apparatus increased strength of signals will be effected. In order to cover the maximum distance it is positively necessary that the stations be in electrical resonance throughout.

For the results of certain experiments along this line we refer you to pages 279 and 280 of Pierce's "Principles of Wireless Telegraphy."

* * *

R. F. C., Westerly, R. I., asks:

Ques.—(1) Please advise me as to the probable wave-lengths of an aerial comprising 3 wires spaced 3 feet apart, 40 feet above the earth, and 100 feet in length.

Ans.—(1) The natural wave-length of this aerial is about 250 meters.

Ques.—(2) I already hear the signals of the Arlington station in the daytime. Will I be able to hear the Key West Naval station at nighttime?

Ans.—(2) You should receive the signals of this station during the more favorable months of the year at night with little difficulty.

Ques.—(3) Will a bell ringing transformer be practical for a 2-inch coil with alternating current?

Ans.—(3) We have witnessed no experiments in this direction, but have been advised that several amateurs have so operated induction coils.

Ques.—(4) Will you kindly give me advice for the construction of a simple wave-meter?

Ans.—(4) Note the article in the series on "How to Conduct a Radio Club" published in the February, 1915, issue of The Wireless Age.

Between the Log Lines

Editor's Note:—All commercial wireless operators are required to keep a record of communications sent by wireless to and from vessels and shore stations, setting down also any incidents of the wireless traffic which serve as a guide to the heads of the department. The record is called a "log" and is turned in by the operator on the completion of each voyage. Land stations, too, send in reports regularly. For the most part these documents are made up of an uninteresting mass of data, of value only to traffic officials; but occasionally a note of human interest creeps into an entry. Sometimes the incidents are humorous, and often they are dramatic. The few random extracts printed on this page give some idea of the highly diversified life of the commercial operator of today.

OPERATOR J. A. JACKSON, on the steamship Santa Rosalia, lying at her dock at Santa Rosalia, Mexico, says that at half-past eleven o'clock on the night of October 6 he was "aroused by shots on shore and a great tumult." An explanation of the disturbance is contained in an entry in the log, an hour later: "Boleo Company's representative informs us a revolution has broken out on shore." At half-past one o'clock in the morning, it is recorded, Jackson "worked NWG (U. S. S. West Virginia, flagship of the Pacific fleet) and told him that the chief of arms had been killed and serious trouble was feared. Help urgently required." At two o'clock the firing had not stopped and it was not until two hours afterward that the log records "Turned in," showing that Jackson had sought relief from his long night vigil in slumber. He did not spend a long time in his berth, however, for at fifteen minutes after nine o'clock he "worked NBJ (the United States warship Albany at Guaymas) and informed him of the trouble. The Boleo Company's representative requesting immediate assistance." Jackson's log relates that he told the Albany at half-past twelve o'clock in the afternoon that the revolutionists had imprisoned the German consul and at eight o'clock in the evening he flashed the news that "the Boleo Company's manager and about 100 ladies and children would be aboard this ship to-night for protection. One man killed on shore so far this evening." The following morning at seven o'clock "the Albany arrived and anchored outside the breakwater." As the log tells the story of the lapse of time from eight o'clock in the evening of the day the Albany arrived to five o'clock in the afternoon of October 11: "Nothing stirring on shore. Albany left early this morning for Guaymas."

* * *

Log entries refer to the difficulties encountered by the steamship Santa Marta. Virginia Beach says that at eight minutes to nine o'clock on the night of February 18 "KLG (Santa Marta) is in trouble yet. Sea very rough. They are going to try steering with hawsers over the stern." At fifteen minutes to three o'clock in the afternoon of the following day the revenue cutter Onondaga was on her way to the Santa Marta, the Virginia Beach log relating that at five minutes after nine o'clock on February 20 "the revenue cutter is now alongside KLG" (the Santa Marta).

* * *

Operator Worrall on the Medina, from Rotterdam bound for New York, on January 22, entered the following in his log: "9 A. M. Passing the vicinity of where yesterday the German submarine sank the British coast patrol ship Mascot. Various bits of flotsam and wreckage are drifting by."

* * *

From Virginia Beach comes word that Operator F. O. (A. Y. Forrest) of that station recently inspected the Dacia while she was lying at Norfolk, and coming down the ship's ladder with Captain McDonald a moving picture man busily turned the crank for the delectation of the curious public.

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WOOLWORTH BUILDING

233 BROADWAY, NEW YORK

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919 Decatur St., New Orleans, La.

E. C. Newton...............*Superintendent*

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F. H. Mason................*Superintendent*

Vessels Equipped With Marconi Apparatus Since the June Issue.

Names	Owners	Call Letters
Escaut	Belgian Government	OSE
Lydie	Belgian Government	OSL
Grace Dollar	Dollar Steamship Co. (re-equipped)	WSF
Schooner Oregon	Crowley Launch & Tugboat Co.	WOU
S. M. Fischer	Reid Wrecking Co.	WPH
Santa Rita	Sun Co.	WTG

PERSONAL ITEMS

Edward J. Nally, vice-president and general manager of the Marconi Wireless Telegraph Company of America, left New York for San Francisco and Hawaii on June 5, accompanied by Mrs. Nally and their children.

David Sarnoff, assistant traffic manager of the Marconi Wireless Telegraph Company of America, was in Rochester, N Y., recently, where he attended the convention of the Association of Railway Telegraph Superintendents.

Sydney St. John Steadman, of the English Marconi Company, who has been in New York for several weeks, has left for San Francisco.

Charles S. Franklin, of the English Marconi Company, who accompanied Guglielmo Marconi on the latter's recent visit to New York, sailed for England on June 3.

The radio inspector of the Bureau of Navigation at San Francisco recently sent word to Washington that awards made known give the Bureau of Navigation a silver medal for educational demonstration of methods and apparatus for enforcement of Federal radio laws. Frederick C. Kolster, as collaborator, received a bronze medal and R. B. Woolverton, as collaborator, received honorable mention.

The wedding of Miss Elsie A. Guldeman, of Los Angeles and A. W. Peterson, of the Hillcrest Marconi station at San Francisco, took place on April 29, at the home of Judge Michael Roche, a friend of the couple.

Frederick M. Sammis, chief engineer of the Marconi Wireless Telegraph Company of America, has returned to New York after a trip to the Northwest, where he made an inspection of the stations in the Northern District.

THE SHARE MARKET

New York, June 22.

Pending the re-opening of the important patent actions postponed by Mr. Marconi's departure for the war without completing his testimony, trading in American Marconis is reported by the brokers as lighter than for several months. Up to the closing hour no sales for the day had been reported and one prominent trader is authority for the statement that his office had not executed an order in six days. This would show, according to Wall Street opinion, that share holders are refusing to part with their stock until the favorable decision expected shall influence a rising market. Trading in other Marconis remains about the same, the conditions reported in the June issue still maintaining in an idle market. Prices show no appreciable decline or advance from the established levels of the past few months.

Bid and asked quotations today:

American, 2¼-2⅝; Canadian, 1-1½; English, common, 9½-14; English, preferred, 8½-13.

MARCONI A LIEUTENANT

A newspaper dispatch from Rome says that Guglielmo Marconi has been made a lieutenant in the Aeroplane Corps of the Italian Army.

RIO DE JANEIRO OFFICES MOVED

The offices of Marconi's Wireless Telegraph Company, Limited, in Rio de Janeiro, have been removed to 37 Rua Visconde de Inhauma opposite the headquarters of the Ministry of Marine and near the offices of the Royal Mail Steam Packet Company.

RADIO RAVINGS

Conducted by D. Phectiff Inslater

SENSELESS

He was a wireless operator—
She was a thoughtless maid—
Out on the grassless lawn together,
Under the treeless shade,
Playing a game of netless tennis,
This, with a bounceless ball—
When from their dineless middle regions
Echoed a soundless call.

Then through the pathless walk they ambled,
Each with a stepless gait,
Into the flyless room for dining;
Each to a foodless plate.
Each with a smileless face then settled
Down in seatless seat.
"Ah, what a tasteless taste!" he muttered;
"Oh, for a biteless eat!"

First 'twas a meatless meal they ordered;
Topped with a crustless pie;
Next o'er an iceless ice they dallied,
Each with a blinkless eye. . . .
Ah, what an endless end I'm reaching—
End of this wordless drool—
He paid the check with a centless dollar
Earned in the Marconi School.

"William," she read, means good. "James means beloved. I wonder——"

A flush mantled her cheek.

"I wonder," she softly murmured, "what George means?"

"George means business, I hope," said mother.

Speaking of money—which, in these very solidly United States, is the Universal Occupation—reminds us of the time that Radio-Fitz charmed a Sweet Young Thing aboard the Momus and heard her chirp, "A penny for your thoughts!"

Hm, soliloquized the operator, 'tis progress—a better offer than THE WIRELESS AGE ever made me.

Which, of course, is a libelous statement. Fitz was paid very generously for his contributions, so generously in fact, that we haven't had one of his pen effusions in a long time.

Lots of our authors have forsaken art for commerce, though. One of our most loyal amateurs recently started making transformers. He announced that he would sell them—but only to big supply houses. We hoped he would, and said so. Several weeks elapsed, though, and not a word was heard. Then we wrote. The reply surprised us. In one big supply house he had been given two orders.

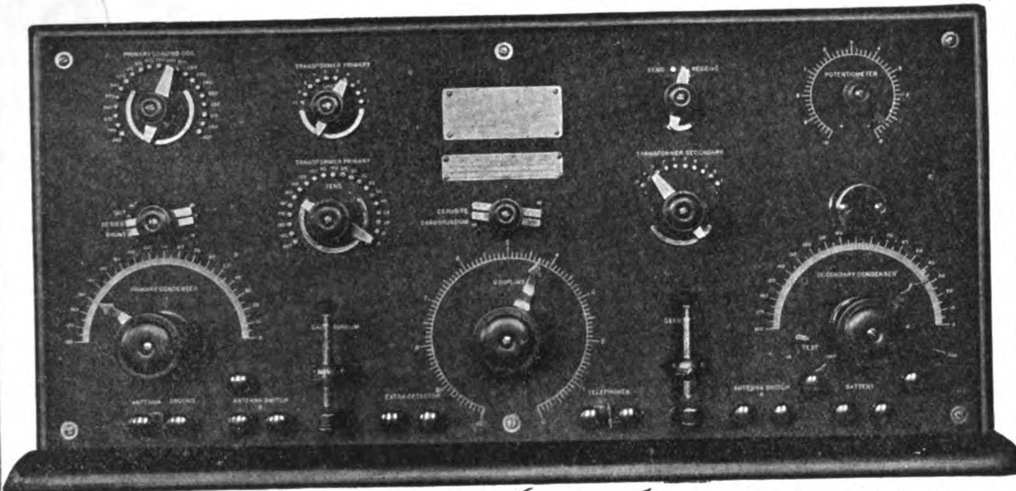
One was to get out.

The other was to stay out.

Giving, to fill out the page, this merry quip a nautical turn means reversion to war talk. . . . And why not? . . . What has become of the Neutral-Americans? . . .

Confidently, then:

Is the Atlantic fer boatin' or verboten?



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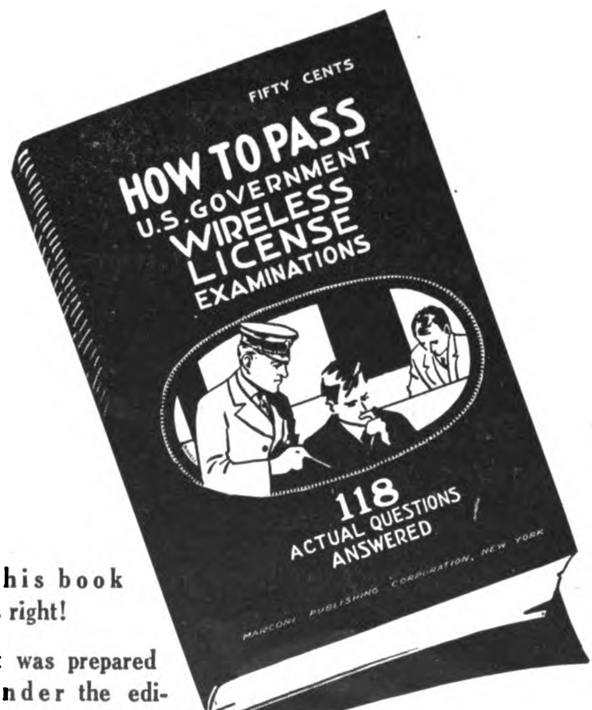
In case of accident to the antenna at sea, if, for example, a portion of it were blown away, on account of the reduced wave length of the aerial, the aerial tuning inductance might not have sufficient

Sit down and write out the balance of the answer—if you can! And this is a very simple question, taken at random from a collection that covers every phase of the license examinations.



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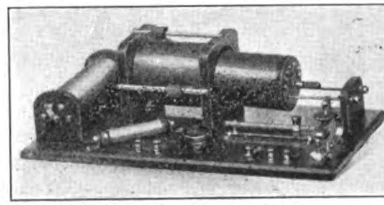

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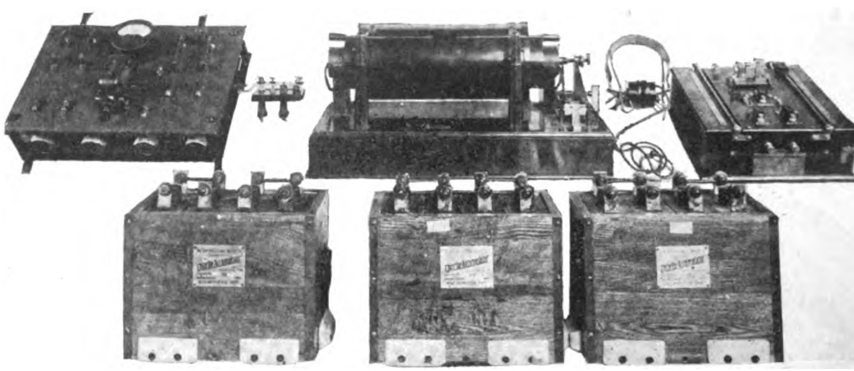

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E. J. Nally,

Vice President and General Manager

THE WIRELESS AGE

THE WIRELESS AGE

An Illustrated Monthly Magazine of
RADIO COMMUNICATION

Incorporating the Marconigraph

J. ANDREW WHITE, Editor — WHEELER N. SOPER, Asst. Editor

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CONTENTS

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THE WIRELESS AGE

Owing to the fact that certain statements and expressions of opinion from correspondents and others appearing in these columns from time to time may be found to be the subject of controversy in scientific circles and in the courts, either now or in the future, and to sometimes involve questions of priority of invention and the comparative merits of apparatus employed in wireless signaling, the owners and publishers of this magazine positively and emphatically disclaim any privity or responsibility for any statements of opinion or partisan expressions if such should at any time appear herein.

AUGUST, 1915

Railroad Wireless

An Impromptu Address by David Sarnoff at the Convention of the Association of Railway Telegraph Superintendents

AN impromptu address on railroad wireless was delivered by David Sarnoff, assistant traffic manager of the Marconi Wireless Telegraph Company of America, at the annual convention of the Association of Railway Telegraph Superintendents in Rochester, N. Y., on June 24. The address was followed by a discussion during which Mr. Sarnoff answered various questions regarding the subject.

"In an organization such as this," said Mr. Sarnoff, "where all or most of the papers and discussions are about wires, and the troubles attendant upon wires, it may seem somewhat unusual to you for a man to get up and talk about wireless because it suggests the thought that you may all be on the wrong track. However, that is not my idea.

"I was interested yesterday in Mr. Lockwood's discussion of the telephone, especially when he talked about a man named Shreve, whom I happen to know personally, and who suggested some very radical ideas in connection with telephone repeaters, but whose superiors thought he was too good a man to lose to let him go ahead. I was envious of that man because my company doesn't seem to feel that way about me. It sent me here without fear of losing me. But perhaps it was influenced by my desire to come here and meet you once more.

Wireless Related to Other Subjects

"The wireless, instead of being a radical step, is, in my opinion, rather closely affiliated with most of the subjects that are being discussed at this meeting. For example, the paper on 'Induction from High Tension Power Lines' is allied, in a way, for only recently I discussed this subject with Mr. Smith of the New Haven at a meeting of the Railroad Club at which Mr. Foley presented a paper, which I had the honor to discuss. Mr. Smith asked me then whether wireless would suffer from induction caused by high tension power lines, and I told him 'No.' That is to say, it is possible to so arrange wireless stations, even though they be situated adjacent to high tension power lines, that no trouble is experienced from induction. Since that time Mr. Smith has carried on some experiments with wireless instruments, probably to see whether I was telling the truth, and found that my statement was warranted.

"Also the paper on the development of the telephone is in a measure related to wireless. Mr. Lockwood discussed the subject of telephone repeaters and it may interest you to know that even with the transcontinental speech which took place last night, there were in use wireless amplifiers, which intensify the speech and which have, to a large degree, made possible practical transcontinental wire telephony.

An Auxiliary Service

"Now, gentlemen, I wish to impress upon you the fact that wireless in railroad work can be utilized as an auxiliary service, for it has the advantage of being strong at the very point where the wire is weak, as in case of a storm, etc. That is the time, of course, when auxiliary communication is most desirable, and wireless fills the gap admirably well. Then, too, there is the possibility of the use of portable wireless equipments for field work in case of floods or other similar instances where it is necessary to get in touch immediately with different points.

"I was particularly interested yesterday in Professor Culver's discussion of wireless. His discussion was instructive to me as a wireless man, as well as

to you who are more or less interested in the subject. There are, however, a few points that I should like to discuss in the few minutes that I have been granted to talk. One is his statement that wireless is an especial branch of electrical engineering, and his advice that you should not give such problems to your own electrical engineering department. While it may be true in a sense, I am afraid that a wrong impression may be left and that is what I wish to prevent.

"The determination of the proper type and power of wireless stations to be installed is a matter for consideration by those of practical wireless experience, but after that has been decided and the stations erected, it ceases to be a radio problem. It is then only necessary to maintain and operate the stations and your own staff is quite competent to do this. When the Lackawanna decided to adopt wireless, the Marconi Company designed, manufactured and supplied the necessary apparatus, determined the power required at the various points, and furnished plans and specifications to the Lackawanna, which installed the equipments under the Marconi Company's supervision. Ever since, the Lackawanna Company has been able to operate the Marconi system without any difficulty whatsoever.

High Towers in Transmission

"The professor also stated that there is no need for using high masts or towers to support aerial wires and seemed enthusiastic about the practicability of aerials a few feet above ground. Well, the use of very low aerials for reception is, of course, well known, but for transmitting radio energy at any considerable distance with such antennae no great achievements can as yet be claimed. It is significant to note that the high power stations erected and being erected by the Marconi Company, the Goldschmidt system, the United States and the British Governments all depend upon fairly high towers to support their radiating antennae.

"Professor Culver also spoke of a wireless relay that is being developed. The Marconi Company has had a long experience with relays, having been the first to use them in connection with the early Marconi coherer receiving sets. Relays in wireless are serviceable for certain particular purposes, but I believe that for the coming few years at least, general wireless communication will be conducted by the present method of acoustic reception for the reason that there is the 'human element' to be considered.

"While wireless does not suffer from induction or sleet storms, there are, nevertheles, atmospheric disturbances in the form of static electricity which is picked up by the wireless receivers. With the use of a receiving relay, these static currents may prove very troublesome, but with acoustic reception the operator can, by concentrating on the pitch or note of the spark which is musical, read the wireless signals witn ease while the static, which is of a very low pitch, can be disregarded.

On Getting Advice

"There is another matter that Professor Culver mentioned yesterday which is rather novel and that is, his caution that you should not take advice from commercial wireless companies, depending instead upon the government for advice. Being a commercial man, I suppose I am naturally biased in favor of commercial companies, but nevertheless it is axiomatic that advice given for nothing is usually not worth very much. Then, too, the government has shown quite an inclination to tell railroad people how to operate railroads, and perhaps it might also tell you how to operate the wireless. It seems to me that if I wanted to build a railroad I should seek advice of the railroad people and, similarly, if you want to build wireless stations you will, in the last analysis, have to be guided by a reliable, commercial wireless company.

"If you decide on wireless communication, it is simply a business proposition. The Marconi company will make a contract with you and will guarantee certain communication. I do not see, therefore, wherein you are required to

take any risks. I said last year in New Orleans that the Marconi Company preferred to rent its apparatus rather than to sell it outright. This policy obtains in marine equipments where the wireless organization is a most important factor. Perhaps there is no other field of communication where organization is as essential as in wireless. It is obvious that the success of any particular railroad in wireless communication is the success of the wireless company that supplies the apparatus, and, therefore, it is to its own advantage to see that satisfactory service is rendered. I found during my experience last year that the railroad superintendents generally think the rental policy somewhat of an obstacle, as the railroad companies do not seem to incline towards renting anything that can be purchased outright. In view of this the Marconi Company is quite prepared to sell its apparatus outright to the railroads, and still furnish them with the benefit of our advice and assistance. We can also by means of our vast organization arrange for periodic inspections and assist generally in solving the different problems that may arise from time to time.

"This is all I have to say, gentlemen, unless you have some questions that you wish to ask, and it will be my pleasure to answer."

L. B. Foley, superintendent of telegraph, telephone and wireless, the Delaware, Lackawanna and Western Railroad, said that he assumed he had the privilege of talking for fifteen or twenty minutes if he had anything to say, but as "I haven't, and as I am very much interested in this proposition, I should be very glad to have you give Mr. Sarnoff all the time he wants."

Interest in Wireless Telephone

Mr. Keenan, the chairman of the meeting, said that "I called upon Mr. Sarnoff and told him that he could have two minutes merely in the way of a joking remark. Most of us are willing to admit now that the wireless telegraph is doing wonderful things, and practical things and all that. We want to know what is being done, and we should like to know particularly what is being done about the development of the wireless telephone so that anybody can handle it as a practical proposition. We are rightly much interested in the wireless telephone."

"There have been two great difficulties to surmount in the development of the wireless telephone," said Mr. Sarnoff. "First, to produce suitable power for the transmission of the human voice, and second, to provide suitable means for modulating the power. You will note that both the difficulties are on the transmitting end. As to the first problem, the production of suitable power, this, I believe, has been practically solved by the high frequency alternator and the other means which obtain for generating undamped oscillations, better known as continuous waves. With regard to the second problem, the modulating of these currents at the transmitter, promising advance has been made during the past year or so, but there is still a lot to be done in this connection before I can say that a practical and commercially reliable wireless telephone for distances of several hundred miles is on the market. Gentlemen, that sort of a wireless telephone is not here yet, but I'm extremely optimistic of its coming—and before many years are over.

Practical System for Railroads

"In connection with the railroad service it seems to me that the wireless telephone will perhaps have its greatest field of utility on moving trains. At the present time, however, the railroads have telegraph stations equipped for communicating between fixed points and as this important communication is subject to frequent interruption, we are urging the adoption of the wireless telegraph as an auxiliary because at the present time it is far more practicable than wireless telephony and, further, because it is a proved and tried proposition. We know that when coming before railroad superintendents we must 'deliver the goods,' and the record of the Marconi Wireless Telegraph system is, of course, well known to all of you.

"Now, it may be of interest to the gentlemen present to know some of the

wireless principles in so far as the actual telegraphing is concerned. I have found in my discussion with the various telegraph superintendents that the first question asked is, 'What is the speed of wireless?' The speed of wireless is limited only by the ability of the wireless operator. As a matter of tact, the Marconi Company has recently erected a set of high power wireless stations which will be in communication with Europe and will compete with the cable companies. These high power stations will employ high speed automatic wheatstone transmission. The stations will operate at a speed considerably in excess of fifty words per minute, and they are to operate for twenty-four hours a day. When I tell you that the scheme required the investment of about five millions of dollars, you will readily appreciate that there were some definite grounds to build on before the Marconi Company proceeded with the erection of these stations. You can use automatic machines on wireless reception as well as transmission it you like. The telegraphone is quite adaptable to the wireless service. We have used it at our high power stations.

"Now, Mr. Chairman, I think that perhaps I might throw more light on the subject if the gentlemen present will ask me such questions as may be in their minds."

Mr. Hall, telegraph superintendent of the Missouri, Kansas & Texas Railway, said that he would like to ask Mr. Sarnoff concerning the weight of the portable apparatus that could be used in flooded districts.

Light Apparatus Desirable

"I have had cases," he declared, "where we could have transported a light weight set to the other side of a flooded district where we wanted to establish communication and where we couldn't float wires in any manner, there being no trees or anything to carry the wires. We were completely out of business until the flood subsided. If you have a light portable apparatus that could be taken over in a boat, it would be of immense railroad possibilities."

"We have a portable equipment which is rated at a quarter kilowatt," replied Mr. Sarnoff. "The transmitting and receiving apparatus is contained in a suit-case which weighs about fifty pounds. In addition to the suit-case there is a motor-generator or hand-generator weighing about fifty pounds which furnishes the necessary current for the wireless transformer in the suit-case. Where direct current is available the motor generator can be used, but where no current is available the hand generator is required. In connection with the portable equipment it is necessary to have portable masts about twenty-five or thirty-five feet in height or in some cases it may be feasible to string antenna wires on trees or telegraph poles. With such an equipment, communication from twenty-five to fifty miles can be reliably conducted. Similar sets are used with success by the United States army, and also by the various European nations now at war."

"The average telegraph pole is about twenty-five feet," said Mr. Hall. "Suppose we should go on each side of the flood where the wires have not been disturbed and hook the antenna wires upon the poles. Couldn't we use them for the aerial?"

"That would be entirely feasible," replied Mr. Sarnoff.

Cost of Equipment

Mr. Caskey, telegraph superintendent of the Lehigh Valley Railroad, said that he was somewhat interested in the question of costs. He asked: "Could you give me an idea, approximately, as to the cost of a wireless set, properly equipped for railroad work, which could be extended from point to point?"

Mr. Sarnoff, addressing the presiding officer, said he would have to ask whether he could answer this question.

"Certainly, go ahead," replied the chairman.

"In order to give you a reply to your question," said Mr. Sarnoff, "it is necessary to know how many stations you would desire and the approximate distances between the stations. Conditions vary, of course, on each railroad. Just what have you in mind, please?"

Mr. Caskey had in mind a distance of 450 miles divided between five or six points.

"That means," declared Mr. Sarnoff, "that you would want six stations, one station at each of the six points, and your communication would have to be over a distance of approximately seventy-five miles. Now, it is possible to communicate over a distance of one hundred miles or so with one kilowatt of power, but so there may be a sufficient amount of power to operate successfully under the worst possible conditions over land, a two kilowatt station would be preferable, and the approximate cost of a two kilowatt station is about $3,000. This includes transmitters, receivers and all other necessary parts, but exclusive of towers, which the railroad company would, of course, have to supply. For a two kilowatt station to operate one hundred miles, it would be necessary to have two towers about 125 feet high. They cost something in the neighborhood of $300 each, but it may be possible to utilize either a smoke-stack, chimney or water tank, or any other means of support at one end of the antennae, thereby reducing the expense of towers. In your case, Mr. Caskey, the total cost would probably be in the neighborhood of $20,000."

"Can you have duplex transmission?" asked Mr. Wells.

Duplex Transmission Possible

"Yes, sir. It is possible to have duplex transmission. The Marconi high power wireless stations, which will communicate between the United States and Europe, will employ duplex operation. These stations are of 300 kilowatt capacity, and I might add that the Marconi high power stations at Glace Bay, Nova Scotia and Clifden, Ireland, have been operating duplex wireless telegraphy for the past several years and with great success."

Mr. Caskey asked: "In the case of a supposed plant of 450 miles would it be possible to have a set at each end of a different capacity to work between the extreme ends, and at the same time to operate between the intermediate station?"

"Yes, it is possible, but you would require sets at the two extreme ends of greater power. In case of 450 miles, a ten kilowatt set is a conservative estimate. I always favor having sufficient power so that operation can be maintained under the worst conditions. For ten kilowatt sets, the price would, of course, be correspondingly increased."

"What kind of power is necessary in wireless telephone transmission?" asked Mr. Van Etten.

Power for Wireless Telephone

"There are three methods of generating current necessary to produce electric waves," said Mr. Sarnoff. "The first and most common is the spark system which produces damped or discontinuous waves; the second is the direct current arc method which produces sustained or continuous waves, and the third is the high frequency alternator which also produces continuous waves. For wireless telephony the last mentioned method of generating electric waves is perhaps the best."

Mr. Lee said that he would like to ask if thought had ever been given to the production of wireless communication between head and rear of freight trains, or anything of that kind.

"A great many railroads, I believe," he declared, "have looked into the question of a telephone or signal communication between the head and rear of trains, and the thought has occurred to me that possibly wireless might be used for either the transmission of the voice or signals, whereby, no matter whether the train is broken in two or cut in two for switching purposes, they can still communicate. I believe there is a field there."

"Yes, thought has been given to this problem by the Marconi Wireless Company only recently," replied Mr. Sarnoff. "We took the matter up with one of the eastern railroads. We found it entirely feasible to install a transmitter at the rear of the train and a receiver at the head of the train, and to signal from the rear to the front."

"The distance being so short, would the expense be low enough so that it would be feasible?" inquired Mr. Lee.

"Yes, the expense of installation would be very negligible, as compared with the advantages of the instrument. A set of that sort could possibly be gotten up for somewhere in the neighborhood of $500."

"Is that transmission telegraphic or telephonic?" asked Mr. Cline.

"Telegraphic preferably," said Mr. Sarnoff. "I refer to signals. I understand what is wanted is signals from the rear to the front, not communication both ways."

Mr. Lee said that he had both in mind, but really the signal idea would carry out the purpose. There would be difficulties in voice transmission other than those attending the wireless proposition. For instance, the noise of the locomotive would be of a disadvantage in talking, while signals could easily be interpreted. That would probably answer all purposes.

Mr. Sarnoff said that he had based his reply upon that understanding. He declared that the expense would be greater for the telephone and it would hardly be as practicable as the signal system.

"I looked into the question as to telephone connection between the engine and the rear of the train several years ago," said Mr. Kissinger, "and I believe that if satisfactory telephonic communication could be arranged for long trains it would be very beneficial, provided it could be done for a reasonable sum. As I said, I looked into the question at the time. A figure was given to me of a possible wireless telephonic plant that would cost approximately $100 per train."

Advantages of Signal System

Mr. Sarnoff inquired if that estimate was for both ends, and, upon receiving an answer in the affirmative, said: "That is pretty cheap. However, with the interest displayed in this particular direction, I shall be glad to follow it up further. I have been thinking of the signal end of it all the while and that, as I've said, would not be very expensive. Telephonic communication will be a little bit more difficult on account of the noise, and I do not know whether the engineer of the train would be able to pay the required attention to the equipment, while the signal would tell him at once what he would be required to do."

Mr. Foley informed the speaker that "we will loan you a freight train any time you want to conduct further experiments," receiving the thanks of Mr. Sarnoff in reply.

The Chairman then said:

"I have been over Mr. Foley's railroad and looked into this question. He has a fine system. If Mr. Foley cares to make any further remarks now, I know we shall all be glad to hear from him."

Wireless Telephony on Railroad

"I was under the impression that I had given my time to Mr. Sarnoff," said Mr. Foley, "but I will tell you of an experience we had with the wireless telephone. About four weeks ago we transmitted by wireless telephone five messages between Scranton and Binghamton, a distance of sixty-three miles. They were copied by an operator and repeated back over wireless. We think that is a record for wireless transmission in the United States. An operator on board train has reported that particular train from the despatcher as it passed the station in the zone of forty miles, and the despatcher got the report and put it on the train sheet."

"Well, that is promising," the Chairman declared, "and along that line, I will say that with this change in the By-Laws, that you have authorized us to make, which we have called committee work, we shall always have a committee to investigate and report, and I think we have present here members of some of our committees on wireless to keep us advised. While this subject was not scheduled it has been very interesting. We had more papers offered than we can take care of. We discussed the wireless in New Orleans at the annual meeting, and we had it in New York, and it looks to me as if we would have to have it as a standing subject, because I am interested and I know all of you are, and it will be necessary for us to keep right up to date on the subject. I am sure the Association wishes to encourage Mr. Foley and the Lackawanna Railroad, as well

as the Marconi Company and the other concerns."

The discussion ended with a remark by Mr. Foley, who declared that "Professor Culver gave us a very good point yesterday when he said that he did not think high towers would be necessary. That may cut down the cost of installation very much."

The president of the association appointed the following committee on wireless telegraph and telephone developments: L. B. Foley, chairman; David Sarnoff, J. F. Caskey, R. H. Carson and W. J. Kelly.

E. J. NALLY HONORARY MEMBER OF ASSOCIATION

Edward J. Nally, vice-president and general manager of the Marconi Wireless Telegraph Company of America, was elected an honorary member of the Association of Railway Telegraph Superintendents at the last annual convention of the association held in Rochester, N. Y. He sent a telegram expressing his thanks which was read to the convention. Theodore N. Vail, president of the American Telephone and Telegraph Company, was also elected an honorary member of the association. Mr. Nally recently returned to New York after a trip to the Hawaiian Islands and the Pacific Coast, where he inspected the Marconi stations.

THE SHARE MARKET

New York, July 21.

In contrast to conditions reported in the July issue, the close of to-day's trading in Marconis shows an activity that is gratifying, noteworthy advances in both American and English issues being recorded in the day's transactions. Canadians remain at the same level and are inactive, but both common and preferred stock of the parent British company is in demand at better values than have been quoted for months. American Marconi is unusually strong, the brokers assert, and one prominent operator reports willingness to trade in thousand-share lots. The general opinion among active traders is that the market shows a shortage and the general public demand recently aroused cannot be supplied owing to difficulties in marketing experienced by the considerable number of shareholders living abroad. It would appear that the long period of idleness has left only the professional element in the market and the buying orders now coming in from the general public must continue to be filled from the open market at the advanced prices.

Bid and asked quotations to-day:

American, 3⅜-3⅝; Canadian, 1-1½; English, common, 10-16; English, preferred, 9½-15.

MARCONI INTERNATIONAL MARINE COMMUNICATION CO.

At the annual meeting of the Marconi International Marine Communication Company, held in London, July 7, it was stated that more than 4,000 Marconi operators are in the service of the army and navy. Expressions of appreciation of resource and courage displayed by the men had on more than one occasion been made by the Admiralty, said Godfrey Isaacs, chairman.

The business of the company, it was announced, had suffered through the war and during the last five months of the year showed considerable disorganization and some loss. Notwithstanding the increase of work and strain placed upon those responsible for the conduct of the business, however, substantial progress had been made, the revenue from ships' telegrams, subsidies, etc., showing a substantial increase over the amount for 1913.

Ship stations owned and worked by the company numbered 788 at the end of 1913; these increased to 905 at the end of 1914; the total to June 19 of this year showing a further increase to 970.

DINNER IN HONOR OF MAJOR RUSSEL

The Washington section of the Institute of Radio Engineers gave a farewell dinner in honor of Major Edgar Russel, chairman of that section, at the University Club in the Capital, on June 22. Toasts were given by Captain Bullard, U. S. N.; Mr. Cram, Dr. Austin, and others. Major Russel is soon to take up duty at Honolulu before being retired at an early date

Arlington's crew: reading from left to right they are: J. C. Ferree, H. Yahnel, H. R. Miller, C. D. Palmer, D. J. Burke, E. P. Jett, L. C. Corbon, W. Kweder, C. V. Deforest, J. W. Scanlin, Lieut. R. B. Coffman, U. S. N., P. A. Tracy, G. C. Hildam, N. E. Eoson, G. L. Bain, L. R. Bailey and H. L. Pitts. The author, Mr. Pannill, is standing in the doorway

NAA

The Naval Station at Radio, Va.

By Charles J. Pannill

Commercial Traffic Superintendent.

MANY of the loyal and steadfast citizens of these justly famed United States think of Virginia as the locality wherein were produced Blue Ridge Mountains, beaten biscuit, hospitality and six other presidents besides George Washington and Woodrow Wilson. On the other hand, others of us think of it mainly in terms of time signals and weather reports. For, taking it from this magazine's viewpoint, something like ten thousand—or maybe fifteen or twenty thousand—Americans regularly each night attune wireless equipment of various sizes, shapes and powers to the electrical voice of NAA, and, listening a moment, snap watch cases shut with the feeling of satisfaction that comes with knowledge of an accurate timepiece.

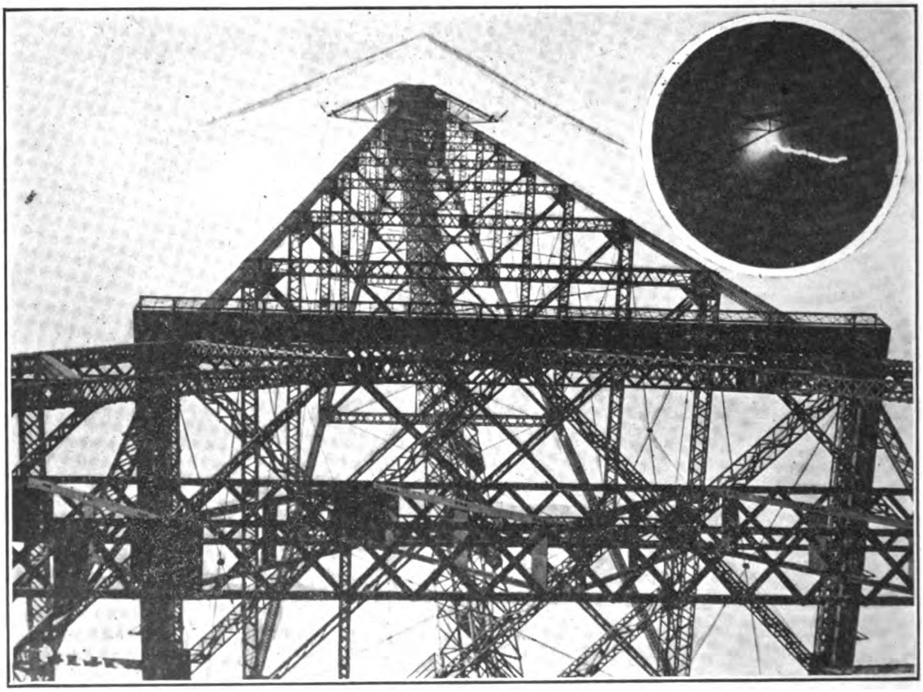
But, aside from this and the matter of adding further distinction to the state which holds them, the tall towers of Arlington take on added interest through marking the spot which concretely expresses twentieth century progress in a single word or name.

Three years ago, when it was decided that there should be erected the premier wireless station for government use, it was decided that the local names of Fort Myer and Arlington, expressive enough in the vicinity, did not fit the spirit of the project; so early in 1913 was created the township of Radio, first of the name in the United States, and duly and forthwith dignified with a post office. Political patronage held no part in this action, let it be said in anticipation of questioning voices; the postmaster appointed was none other than the clerk to the officer in charge of the wireless station, a petty officer in the naval service and by coincidence fully qualified to handle the job. Further recognition of the township was promptly added by the railroad changing the name of its station from St. John to Radio.

All over the country wireless groups and individuals watched with interest when it was announced in the latter part of 1912 that the now familiar brick building was completed. About the same time the last bolt was driven in the towers and the high-swung aerial sent its first disturbance into the ether. Reports from distant points told of signals received, so to definitely determine the station's range the new Naval Radio Service department ordered the U. S. S. Salem to proceed to sea and conduct a series of tests.

Results indicated that good communication could be had over 2,000 miles, with greater distances spanned at night under favorable conditions.

Since then tests have been made between Arlington—to use its more familiar designation—and Paris, determining by radio signals the difference in longitude between Paris and Washington. These tests lasted several weeks, both governments detailing a board of officers to aid in their conduct. Later an improved outfit replaced the former equipment and Arlington established direct communication with the Pacific Coast, more than 2,000 miles overland, in daylight operation. Following this the naval station at Darien in the Canal Zone was completed, and constant communication



Looking upward from the base of the 636-foot tower; in circle, a bolt of lightning headed for the aerial

kept up even during the summer in daylight, the signals being easily read when standing several feet away from the receivers.

Each day at noon and 10 p. m. valuable information for shipping in general is forwarded by NAA, including time signals obtained from the Naval Observatory at Washington. The clock at the Observatory is connected by relay with the 100 k. w. spark set at Arlington which automatically transmits the time signal dots. In this way not only the ships at sea, but others, including a large number of jewellers on shore, keep their time pieces accurate.

Arlington is well equipped with transmitting apparatus, all of the most improved style, a large outfit using a spark for signals to ships at sea while a small spark set is used for close range work with naval shore stations.

The 100 k. w. outfit was thoroughly tested at Brant Rock in 1912 and it was then decided by the Department to transfer the set to Arlington. It is from this set that storm warnings, time signals, etc., are sent.

The towers are of the self-supporting type, one 636 feet in height, and two 420 feet in height. A very interesting illustration is shown in this article, a view taken from a point at the base of the 636 foot tower, looking upwards. The base insulation shown in another picture has since been short circuited, as it was found that better results could be obtained with all of the towers grounded. A third picture shows the staff of the Arlington station, which includes Lieutenant R. B. Coffman, U. S. N., officer in charge, and sixteen electricians and operators.

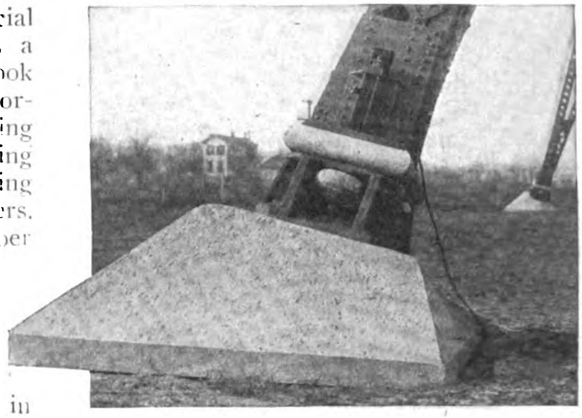
Proof that among thousands of amateurs, NAA has an interested audience every night. This group learns with relief what weather can be expected on the morrow

In November, 1912, the Navy Department appointed a Superintendent of the Naval Radio Service, with headquarters at Radio, Va. The Superintendent was directed to organize the service and make the necessary traffic agreements with the various commercial operating companies for exchange of traffic as well as organize the proper system for handling the Government traffic in the Naval Radio Service. That the superintendent and his staff succeeded in overcoming these obstacles is evidenced by the successful operation of the Naval Radio service to-day and the ease with which traffic is exchanged with the hundred and odd controlling factors concerned in hand-

ling of Government and commercial work throughout the world. As a courtesy the Naval Radio service took over the handling of accounts for foreign traffic and is to-day the clearing house for all such accounts, collecting the tolls from the various controlling administrations, including shipowners, and passing them along to the proper systems.

The Superintendent is also responsible for the proper operation of the radio service during time of peril, being now in charge of censoring radio traffic in the United States and the operation of the Tuckerton and Sayville trans-oceanic stations operated by the Naval Radio Service in the interest of the public. The Superintendent and his staff include the following: Captain W. H. G. Bullard, U. S. N., Superintendent; Lieut.-Commander S. W. Bryant, U. S. N., Assistant Superintendent; P. A. Paymaster J. H. Knapp, Disbursing Officer, and Charles J. Pannill, Commercial Traffic Superintendent, formerly Superintendent of the Southern Division of the Marconi Wireless Telegraph of America.

The field of the Naval Radio Service also covers the radio service afloat, in that all naval ships report regularly to the Superintendent the traffic handled. The Atlantic and Pacific fleet each have a Fleet Radio Officer who is responsible to the Commander-in-Chief for the proper radio operation. When the Atlantic fleet was first given a Fleet Radio Officer, the honor was bestowed upon Lieutenant S. C. Hooper. He was placed on the staff of the Commander-in-Chief. Together with Captain Bullard this officer laid the foundation of successful operation; both officers through hard work and constant devotion to this duty have worked wonders for the improvement of the radio service in general. For when Captain Bullard and Lieutenant Hooper took hold of the work the commercial radio service of the various companies was practically without government jurisdiction; the high standard of both the naval and commercial radio service to-day is due in a great measure to the



The base of the towers, showing the insulation which has been short circuited, better results being obtained with all towers grounded

fact that these two men were able to bring about proper co-operation between the commercial concerns and the government for the betterment of all concerned. The few verses which follow were written by one familiar with Mr. Hooper's connection with the fleet work:

In olden days—those were the golden
 days——
Would you hold converse with your
 friend "YE"
At Washington, you let the Fleet rave
 on,
And chatted gayly with him at the key.
Not caring to disregard all scheme or
 plan,
You opened up with "Here's a note, old
 man";
But wireless to-day runs on a different
 plan.

It's Hoops, Old Hoop,
He changed those easy ways.
Order rescinding order keeps us in a
 daze.
If you want to know what gink
Put social wireless on the blink
It's Hooper, old Hooper, he's the goop.

Time was when, on a battleship,
 thoughts tender might intrude
Of sweethearts, even wives, who wept
 ashore,
"Just ask the Chief at NAM to phone
 this up for me,"—

This was the password, but it is no more.
The Postal Clerk computes the station charge—and gets it wrong,
The C. O. then endorses it, and maybe before long
Marconi condescends to forward love's eternal song.

It's Hoops, that's why.
Who other could it be?
He is the man who owns the copyright on QRT
If you really want to know
Who put "I owe" in "Radio"
It's Hooper, old Hooper, he's the guy.

The conning tower thru its narrow eyes surveys the scene
And feels itself sunk to a storeroom's state.
With switchboards, relays, tuners, keys, in all availing space,
There seems no chance for things of lesser weight.
Such minor apparatus as control of helm or speed,
A super-Hooper-dreadnaught of course could never need.
Install! Install! There yet is room! Prove, prove, the Newer Creed.

It's Hoops (You knew it?)
'T is his the scheme, of course.
Should not the brain have full control o'er bowel-hidden force?
On, on to Victory!
Press, press, the fluent key!
And Hooper, old Hooper, HE will do it.

When Giant and Athletic meet before a countless throng
To battle for a name—and many yen;
When from the far-flung bleakness of Cape Cod the whisper comes
Of tiny happenings in the world of men,
Whose hand directs the order that bids tactics bide apace,
As inning after inning flings its record into space,
Or T. T. tells the outcome of the 1916 race?

It's Hoops, he did;
The C. in C. may sign,
But when the bets are paid in coin, cigars, or even wine,
Well, well, the wardroom knows
To whom the credit goes.
It's Hooper, old Hooper, good old kid.

When on the dim horizon line a mighty warship lies,
Then moves, responsive to a hidden sign,
Harmonious with her sister ships that dot the distant deep,
To form as one in one manoeuvered line,
Whose years of earnest effort made such ordered actions show,
And prove by demonstration the worth of radio,
Till even the prejudice of years must needs admit it so?

It's Hoops! His ways
At last have gained their goal.
The flagship reaches out across the waters to control.
In unity complete
The Ship yields to the Fleet.
And Hooper, old Hooper, deserves the praise.

POWER OF BROWNSVILLE STATION INCREASED

The government wireless station in the control of the army at Brownsville, Tex., has been increased to nearly double its former capacity and now can communicate with vessels at sea 800 miles from the station, it is asserted in a dispatch from San Antonio, Tex.

The station handles a large portion of the military messages from the border patrol along the lower Rio Grande to the Army Department at Fort Sam Houston in San Antonio.

NEW STATION AT POINT ISBELL

The United States collier Jason arrived at Galveston recently and discharged a complete 5 k.w. wireless set, including masts, to be shipped to Point Isbell, Texas, on the Rio Grande, where the Navy will erect a station to communicate with the battleships off Tampico and Vera Cruz.

The Seizure of the Sayville Station

Plant Now Conducted by United States Government in the Interest of Its Owners

Captain William H. G. Bullard, who was detailed to take over the Sayville station

FOLLOWING the application of the owners of the Sayville wireless station for a license to operate a "new sending set" as a private commercial station in transmitting messages to Germany, the United States Navy Department announced on July 9 that in the future the plant will be conducted by the government in the interest of its proprietors. This action was taken to preserve the neutrality of the United States in accordance with President Wilson's order of August 5, 1914.

William C. Redfield, secretary of commerce, made public a memorandum which contains the reasons for the refusal of the government to grant a license. Robert Lansing, secretary of state, concurred in the opinion of Secretary Redfield, and their joint recommendations were accepted by President Wilson. The memorandum is as follows:

"I beg respectfully to advise as follows concerning the reported erection by the Atlantic Communication Company of new radio apparatus at Sayville, Long Island, N. Y., for the transmission of message to and from Nauen and Eilvese, Germany:

"The Atlantic Communication Company, per H. A. Metz, president, and Dr. K. G. Frank, secretary and treasurer, has applied for a license for the operation of what it calls in its application of June 17, 1915, 'the new sending set of the Sayville station.' The formal application for a license was dated April 27, 1915, and action thereunder has been deferred pending the completion of the station, which is now substantially ready for operation.

"There are features in connection with this application which make it seem to me inadvisable to grant the desired license. These are as follows: The Atlantic Communication Company is owned by the Telefunken Company of Germany, which is itself owned by the Siemens and Halske Company and the Allegemeine Electrizitats Gesellschaft of Germany. The Siemens and Halske interests, together with the Allegemeine group, are the controlling German electrical interests. Dr. Karl George Frank, who signs the communication from the Atlantic Communication Company as

secretary and treasurer, is the representative in New York of the Siemens Electrical Companies. These German interests own the entire stock of the Atlantic Communication Company, save a few shares sufficient to qualify Mr. Herman A. Metz, its president, to act as such officer. Mr. Metz is the representative in this country of prominent German dyestuffs interests.

"The German stations appear now to have a duplex management, the military features controlled by the military authorities and the commercial features by the Imperial Post Office. These stations, thus controlled, are those with which the Sayville apparatus directly communicates.

"The department is further advised that Professor J. Zenneck, who is a captain of marines in the German army and who has been during the present war serving in the trenches in Belgium, was brought to this country as a witness in a wireless patent suit pending in our courts between the Telefunken company and the Marconi company. This suit has been put over until autumn, and on the ground that it is impossible for Captain and Professor Zennick to return to Germany the Atlantic Communication Company is retaining him at Sayville to make experiments with a view to overcoming difficulties of static atmospheric conditions experienced in receiving messages from Germany at Sayville. In a written statement, copy of which is attached, dated June 17, 1915, Captain and Professor Zennick states the duties he will thus assume.

"It is an unquestioned fact that the station for which the license is now asked is in all its part new since the war began; that the machinery has been manufactured in Germany and shipped hither, and the towers, aerials and other apparatus are new; that, in short, what is now asked is not a license for the continuance of a station heretofore existing, but one for the operation of a station just coming into service.

"It is the opinion of this department that to grant a license for a new station erected since the war began with German apparatus, avowedly under German ownership and control, communicating avowed with stations known to be under the control of the Imperial German Government, and having least the semblance of acting in a measure under the instructions of the German Post Office Department, having as scientific assistants, if no more, an officer of the German marine corps and the representative in this country of prominent German manufacturing and scientific interests, would be an unneutral act. This department therefore purposes to decline to grant the licenses asked under existing conditions.

"It is noteworthy in this connection that the Marconi company, which connects with stations in Poldhu, in Cornwall, and Clifden, Ireland, is not undertaking to operate its transatlantic stations and has asked no licenses for them, stating in this connection to this department that its European stations named, being under the control of the English government, it does not think it best to attempt communication with them.

"This department, however, deems it important for commercial reasons that opportunity be extended for the assured neutral use of the Sayville station for communication with Germany and Austria, which the Atlantic Communication Company say in their application of the 18th of June 'depends largely on the efficient operation of the Sayville station.'

"It therefore repectfully suggests for consideration whether equity to all concerned would not best be secured by having the Navy Department of the United States operate the Sayville station, turning over the fiscal proceeds of such operation to its owners and securing them and the government of the United States, alike, against all question of improper use while providing for both the valuable service which this station is fitted to render."

Captain William H. G. Bullard, superintendent of the United States Naval station at Arlington, was detailed to take over the Sayville plant, the greater number of the operators employed by the Atlantic Communication Company being replaced by enlisted men of the United States Navy under the command of Lieutenant George R. Clark. Messages will be sent and received subject to strict censorship. Professor Zenneck left the station after

the government had taken possession.

In a statement issued by the company it is declared that "simply for the purpose of protecting its legal and financial and commercial rights, the company has formally filed protests against the Navy Department's action with the President, and with the State, Navy and Commerce departments." It is also pointed out that "the company being a public service corporation had no discretion in refusing or accepting messages. As a matter of fact, the station, on account of static conditions, and also on account of lack of power, was unable during the summer months to communicate with Germany for more than one or two hours during the night. This difficulty will now be overcome by the operation of the new transmitter. Communication has been possible for the past few months only when it was night in Germany and night in the United States, which has been, as heretofore stated, only for one or two hours each night."

President Wilson said in his Executive Order that "Radio stations within the jurisdiction of the United States are prohibited from transmitting or receiving, for delivery, messages of an unneutral nature and from in any way rendering any one of the belligerents any unneutral service," and it is desirable to take precautions to insure the enforcement of said order, in so far as it relates to the transmission of code and cipher messages by high-powered stations capable of transatlantic communication." The Hague conventions say it is an unneutral act to permit the construction by belligerents of wireless stations on neutral territory after a declaration of war.

War Incidents

WHILE the United States was standing aghast at the attack made on J. P. Morgan by a fanatic of the war, known as Erich Muenter, alias Frank Holt, who also exploded a bomb in the capitol in Washington, information was obtained indicating that the dynamiter had planned to blow up a ship at sea. Following the disclosure of Muenter's assertion that "a steamer leaving New York for Liverpool should sink, God willing, on 7th (July), a general warning was dispatched broadcast over the Atlantic Ocean by wireless, among the vessels which picked up the message being the Atlantic transport liner Minnehaha. The marconigram was received on the Minnehaha, which carried a cargo for the British forces, soon after midnight on July 7. Late in the afternoon of the same day an explosion occurred. A fire followed, the members of the crew being compelled to fight the flames for two days and nights. The wireless was called into use again on July 12, when additional warnings were flashed warning commanders of ships to be on the lookout for bombs.

A letter written by Muenter to his wife induced the suspicion that he had planned to destroy ships. One paragraph read as follows:

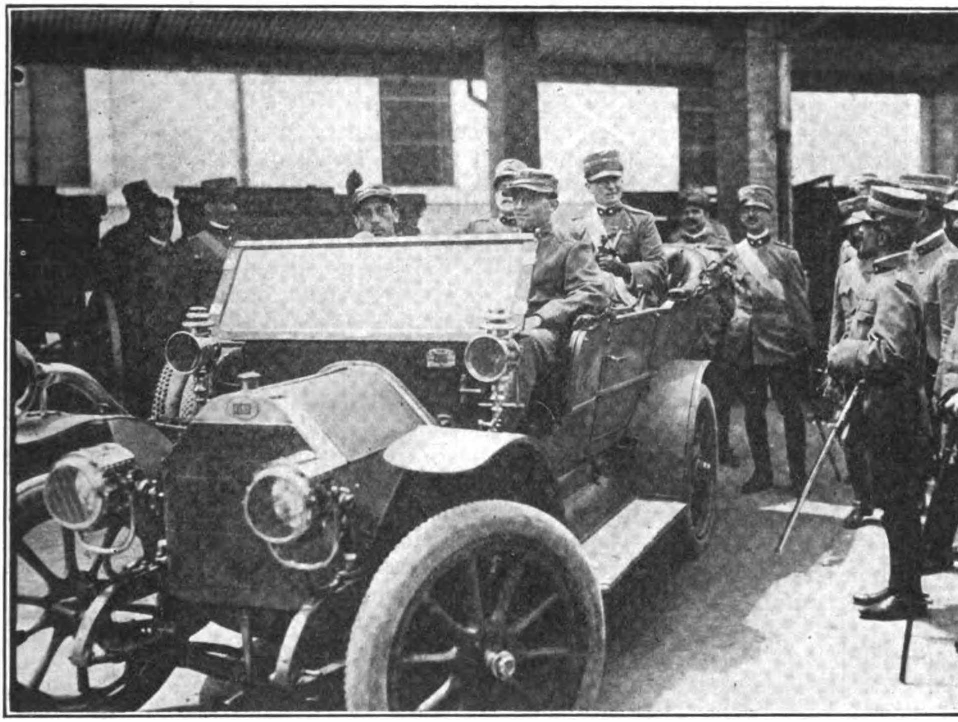
"A steamer leaving New York for Liverpool should sink, God willing, on 7th. It is the Philadelphia or the Saxony (Saxonia), but I am not sure, as these left on the 2nd or 3rd."

Immediately after this revelation had been communicated to officials in Washington a warning was flashed by wireless. The Minnehaha was only a few days out of New York Harbor, bound for London, when the message was received. Captain Claret, the commander of the vessel, ordered the small boats swung out so that they could be ready for use in the event that the explosion occurred. The ship's fire hose was also prepared for an emergency and a search of the cargo was begun. The search was still under way late in the afternoon, the explosion occurring while the members of the crew were trying to make sure that there were no bombs aboard.

The explosion shot off a hatch cover, carrying two sailors into the air with it. One of the men was slightly injured. Then the fire was discovered, the flames spreading so rapidly that it was decided to point the prow of the Minnehaha toward Halifax. She reached that port on July 9th.

The Saxonia of the Cunard Line and the Philadelphia of the American Line

Photo Underwood & Underwood.



Guglielmo Marconi, officer in the Italian army, leaving headquarters for inspection of wireless stations at the front. He is seated on the right in tonneau of automobile

sent prompt answers by Marconi wireless in response to the message of warning. The following marconigram was sent by Arthur R. Mills, commander of the Philadelphia:

"Thorough search made. Everything on board identified."

E. G. Diggle, commander of the Saxonia, replied as follows:

"Search made. Nothing found."

A letter signed "Pearce," the writer describing himself as a partner and intimate associate of Muenter, was sent to a New Orleans newspaper on July 11. The letter, which contained threats to destroy by bombs British ships clearing from American ports, was considered important enough by Washington officials to warrant the sending of a wireless message of warning to all ships on the Atlantic, especially the steamships Howth Head and Baron Napier. All ships were requested to communicate with these two vessels. The Howth Head and the Baron Napier both left New Orleans on July 9th with cargoes for the Allies. The Baron Napier, which is equipped with Marconi wireless, is bound for Avonmouth, England. The Howth Head cleared for Belfast and Dublin, but was scheduled to put in at Norfolk en route. The Arlington station sent the warning to the naval station at Key West, to be flashed to the ships.

A despatch from London says: Guglielmo Marconi, who as a Lieutenant of Engineers in the Italian Army, is in London buying war equipment for the Italians, in an interview spoke hopefully of the Allies eventually winning the war. Marconi, bronzed from his trip to the Italian-Austrian firing line, says the spirit of the Italian troops is vivid with the persistence to smash the enemy. Italy has thrown her whole energy into the war, he said, and is ready to fight on until her flag is victorious, no matter how long the war endures.

"It's inspiring to see the Italian troops in action, with their undaunted courage and undoubted skill," he said. "They have not the slightest doubt that they

will vanquish their Austrian foes. The Italians have nearly everything they need in the way of equipment. I'm in London merely to buy a few things that they lack. As to ammunition, Italy is well supplied, having steel works going day and night making shells and guns. Before going into the war she made sure she was able to carry it on upon a gigantic scale, and she'll not suffer from lack of ammunition.

"The whole populace of Italy is imbued with the same spirit that dominates the army, the nation in its entirety being bent on pushing the war to a successful end. People are ready to make any sacrifice to aid the government. Already plans are working out for rigid economy in Italian households so there will be no waste of foodstuffs or of money. The people of Italy realize a long war means privation and strained finances. They know Italy must likely borrow heavily to conduct the war and they're already offering their savings. If the time comes that Italy will be obliged to seek outside financial aid the people will back up the government in whatever it does and be ready to assume a heavy tax to pay back after the war.

"That's the sublime spirit that inspires Italy today, and there will be no lessening of it while the war lasts. The impression throughout Italy is the war will last at least another twelve months, although that naturally is only a guess. If Russia could get the ammunition she needs the idea prevailing is that the eastern fighting could be brought to a quicker conclusion.

"It undoubtedly would help if Italy joined the Allies in the attack in the Dardanelles, but Italy hasn't brought itself yet to the point of war against Turkey. Whether it will come is hard to say. The Dardanelles operations with all they mean to Russia are regarded in Italy as a wonderfully strategic stroke. The way the Allies can push it through, as it appears to us in Italy, is to keep on pouring hordes of men onto the Peninsula and to use ammunition lavishly. Its phases and outcome are being watched eagerly in Italy as well as the rest of the world.

"One feature of Italy's war that will tell heavily I believe as the war goes on, is the splendid equipment of aeroplanes and dirigibles. Italy has skilled men to handle them and in a short time I am sure they'll give an heroic account of themselves. In dirigibles we're better off than Germany.

"A feeling of absolute security prevails among Americans in Italy, of whom there are quite a number in Rome, Milan and other parts. They haven't the slightest idea of leaving Italy, having explicit confidence in the ability of the Italian Army to keep the foe out. The progress of the Italian Army on Austrian soil encourages this feeling, besides giving the whole of the Italian population a thrill in Italy's getting back territory that Austria took from her."

Mr. Marconi witnessed the fighting on the Italian-Austrian lines and was deeply impressed by the daring initiative of the Italian soldiers. He will stay in London ten days and then return to Italy.

AN example of how Marconi men are conducting themselves in the European war is contained in accounts of the sinking of the Leyland liner Armenian by a German submarine off Trevose Head, Cornwall, on June 28. The Armenian's officers sighted the submarine early in the evening, the latter craft firing two shots across the bows of the English vessel. The Armenian showed her heels, however, and the submarine followed, shelling the merchantman unceasingly.

"The ship suffered heavy damage and there was considerable loss of life," said one of the Armenian's officers in describing the occurrence. "The first shell found its mark, bursting on our starboard side and killing ten men outright. Another smashed the Marconi cabin, but the operator stuck to his post till the last, sending the S O S signal until the apparatus was smashed."

Advices from Rome declare that the Italian fleet has destroyed the Austrian wireless station on the Island of Lissa, off the Dalmatian coast.

IN THE SERVICE

SHORE-TO-SHIP DIVISION

The life of John R. Irwin, superintendent of the Northern District, Pacific Coast Division, of the Marconi Wireless Telegraph Company of America, has been made up of one adventure after another. Two wars in South Africa gave him his first opportunities to figure in pulse-stirring events. Following his experiences in the veldt, he took a flight in an airship which was wrecked. Then he planned another aerial voyage which was also ill-fated. These occurrences and others, including his activities in sending aid to the victims of a wrecked steamship, were crowded into about a third of the number of years he has lived.

Echuca, a town and river port of Victoria, Australia, is the birthplace of Irwin. His early experience included employment in the West Australian government telegraph service and in 1900, soon after the outbreak of the South African war, he found himself taking part in the hostilities. At that time he was nineteen years old. He served throughout the struggle, and afterwards entered the Transvaal government telegraph service. He was destined to see more of warfare, however, the Zulu rebellion providing him with the opportunity to become active in another conflict.

But even wars and excitement must end, and, South Africa having resumed its normal state, Irwin decided to trek. Retiring from the service under what was known as the retrenchment scheme, he made his way to New York, He entered the service of the American Marconi Company in 1907.

He was on duty at five o'clock in the morning in the Siasconsett station two years afterwards, when he picked up an S O S from the steamship Republic, bound for the Mediterranean. The Republic, which was off Nantucket, had been rammed in a fog by the Floride. Irwin immediately got into communication with the Baltic, and she turned back, feeling her way through the fog to the wreck by means of directions sent by the Marconi man at Siasconsett. Woods Hole, Mass., was also told of the wreck by means of a land line message sent by Irwin and a revenue cutter was dispatched to the scene. As a result of Irwin's prompt action no lives were lost.

Irwin was in the Marconi office in New York one day when a message was received asking for a volunteer among the wireless operators to go on the voyage of the Wellman airship. He asked for the detail and obtained it. The craft collapsed near Bermuda, however, and it became necessary to throw all superfluous weight into the ocean, including the wireless set. Irwin, undaunted by this handicap, signalled the steamship Trent by flashlight and the members of the expedition were rescued. Following this experience he appeared in vaudeville and on the lecture platform. He afterwards re-entered the Marconi service, but when the Vaniman airship expedition was undertaken he planned to go on the flight. He abandoned the project, however. The members of the Vaniman expedition were afterwards killed during a trial flight.

The Wireless Age in a Revolution

Its Part in Hostilities in Mexico

By Fernando Urcelay

Fernando Urcelay

THIS is the story of how THE WIRELESS AGE earned a new distinction—that of taking part in a revolution. It has been my fortune to serve under two leaders of warring factions in my native land—Mexico—although I am only twenty years old. Yet I have not a single scar to show that I am a veteran of the wars; notwithstanding I have vivid recollections of what it means to be in the proximity of booming cannon and flying bullets. This statement seems somewhat incongruous when I recall that the scene of the trouble to which I refer is Merida—a city which is remarkably peaceful as far as appearances go. Regularly built, with attractive streets and squares, Merida in my opinion excels other cities in Mexico which have been more highly praised. For the information of those who are not familiar with the place, it should be stated that it is the capital of Yucatan, located on a plain twenty-five miles from the Gulf of Mexico.

Perhaps my opinion of the place is somewhat biased, due to the fact that it is my birthplace and I still call it home. However, a considerable number of Americans have found it an attractive city in which to live, as well as a profitable headquarters for business enterprises. Large quantities of hemp are sent from Merida to the United States. Other exports include brandy, sugar, salt, indigo and hides, while among its manufactures are straw hats, soap, leather and cotton goods. This brief description will give the reader some conception of the scene in which my story is set.

The advantages of Merida were not sufficient to prevent me from leaving for the United States at an early age, however. I had planned to become a student at Valparaiso University in Indiana, but wireless was in my thoughts and I entered the Marconi School of Instruction in New York. My stay in this country did not last a long time; in fact, I had not been in the Marconi School more than five months when I received a letter from my mother asking me to return to Merida. A revolution was in progress and our property was in danger. So I hurried back home.

On my arrival in Merida I found that Precileino Cortes, then governor of Yucatan, was the leader of one of the forces, while the opposing army was headed by Carranza men. I shouldered a musket and fell into the ranks of the governor's men. But Cortes' power was short-lived, the enemy overpowering our forces and taking possession of the city without great

trouble. Thus ended the Cortes regime.

But the Carranza forces were not destined to remain long in control, their Nemesis being at hand in one Abel Oritz Argunnedo. Originally a clerk, his personality and soldierly qualities made him a leader of men. He was chosen to command the army formed to battle with the Carranza troops, the latter at length finding themselves driven from Merida and Argunnedo in the chair of the governor of Yucatan.

Argunnedo's men were not well equipped with wireless, although they had two portable sets, these being in use by the troops which were making a stand outside Merida. The governor made his headquarters in the city, which was entirely cut off from communication with the outside world. He was anxious to establish wireless communication with other places, but there was no station in Merida, two electrical engineers whom he had detailed to the task of building a set being utterly at sea regarding the work. At this juncture one of my friends informed him that I was able to construct a station. So it came about that I was asked to consult with the engineers as to the steps to be taken.

I had continued to read The Wireless Age during the revolutionary troubles—no small tribute in itself to the magazine. And now that a real problem in wireless had come up—one in which practical knowledge was essential—I congratulated myself on my good judgment in choice of periodicals. Fresh in my recollection of the articles which had appeared in the magazine was one of the series on "How To Conduct a Radio Club," in which details of the construction of a receiving set were given. For directions regarding how to build a transmitter I examined other numbers of The Wireless Age, at length finding in the "Queries Answered" department the information which I sought.

With the clearly defined directions before my eyes I found little difficulty in building a station. Between the towers of the Catholic school and the Cathedral, which are separated by the space of a block, we stretched the wires of the antenna, using three wires placed two feet apart. The transmitting set was built in the tower of the school, the power being obtained from the power house that provided electric light for the city. Our equipment was 1½ k.w.

The work having been completed, I got into touch with several distant stations and was highly gratified at the results. I was able to receive about 800 miles during the daytime and 1,500 miles at night. Among the stations which I heard were New Orleans, Arlington and Campeche, the latter being the capital of the province in Mexico of the same name. I also communicated with ships at Progresso, which is about thirty miles from Merida. The news of the war in Europe which I picked up was eagerly received, the governor being much pleased with the successful operation of the equipment. From time to time I sent various messages for him and frequently obtained valuable information transmitted from the station at Campeche which was in the possession of the Carranza men.

One day I picked up a message from Vera Cruz, saying that 4,000 men were en route to join the Carranza forces. The next day our troops and the Carranza men engaged in a pitched battle at Poboc, twelve miles outside of Merida. Argunnedo's men were afterwards compelled to retreat to Blanca Flor, the news of the defeat being transmitted to the city by means of a portable wireless set. On receipt of this information the governor, realizing that it would be hopeless to remain to defend Merida, fled to Progresso, whence he made his way to New York.

His action was sufficient notification for me that it would be discreet for me to make myself as inconspicuous as possible in view of the fact that the arrival of the enemy's troops in the city seemed inevitable. Therefore I cut the wires of the antenna and secreted the various parts of the wireless apparatus. When Carranza's men arrived I had disguised myself as an Indian and was working in the fields. And in this disguise I remained till I found an opportunity to leave Merida for New York.

On my arrival in the latter city I had opportunity for reflection on the events in which I had figured, chief among my thoughts being the following: That I had cause for congratulation over the fact that Carranza's men were not gifted with vision keen enough to penetrate my disguise. Also that the leaders of every revolution should keep copies of THE WIRELESS AGE at hand.

FIRST WIRELESS COMMUNICATION BETWEEN JAPAN AND AMERICA

THE high power wireless station of the Imperial Japanese Government is approaching completion. It is located at Funabashi, about ten miles east of Tokio. Edward J. Nally, vice-president and general manager of the Marconi Wireless Telegraph Company of America, has just returned from Honolulu where he arranged for the preliminary tests between the Marconi Company's high power stations at Kahuku and Koko Head, on Oahu Island, and Japan. These tests were started on July 26th, and the following messages were exchanged:

TOKIO, July 26, 1915.

Edward J. Nally, Vice-President and General Manager, Marconi Wireless Telegraph Company of America, New York City, U. S. A.:

Availing myself of this opportunity I have the honor to offer to you and Mrs. Nally my sincere congratulations upon this first communication.

(Signed), JIRO TANAKA,
Director General, Ministry Communications.

NEW YORK, July 27, 1915.

Hon. Jiro Tanaka, Director General, Ministry Communications, Tokio, Japan.

Mrs. Nally joins me in congratulations and thanks for the first wireless communication between Japan and America, and also in the fervent wish that this most wonderful of all inventions will still further bind the two countries in peace and progress.

(Signed), EDWARD J. NALLY,
Vice-President and General Manager, Marconi Wireless Telegraph Company of America.

When both stations shall have been fully tried out, the trans-Pacific service of the Marconi Company, in connection with the Western Union Telegraph Company, which has been in operation between this country and the Hawaiian Islands since September 24, 1914, will be extended to Japan, and at rates at least one-third less than the existing cable rates. From Japan connection will be made through the Japanese Imperial Telegraph System with all points in the Orient.

Enthusiastic Reception for Marconi

Guglielmo Marconi began his duties as lieutenant of aviation in the Italian army on June 27. A dispatch from Rome says that he received an enthusiastic reception at the barracks when introduced to his brother officers by Colonel Morris. Lieutenant Marconi said: "I am convinced that we shall work splendidly together for the protection of country and King."

Mr. Marconi in the uniform of a second lieutenant of engineers has been visiting electrical works in and near Milan in connection with the systematic organization of factories of all kinds for State purposes. In each place he had an enthusiastic reception.

At Melzo the mayor and other notables with a large number of people welcomed him, and children presented flowers. Mr. Marconi expressed his appreciation of the reception, saying that he was proud and glad to return to his native country to serve her.

At Sangiovanni, where he visited an electrical establishment, workmen crowded around him, shouting, "Viva Marconi," and expressed their admiration of the inventor.

How to Conduct a Radio Club

Article XVI

By E. E. Bucher

IT is an interesting phenomenon of radio-telegraphy that when certain precautions are observed, signals may be received on a wireless telegraph aerial placed but a few feet above the surface of the earth. An available substitute for this form of aerial is the barbed wire fence which, if it is not extremely long, will permit the reception of signals from certain hign-power stations within a distance of several hundred miles. Owing to the proximity of the earth the natural wave-length of such an aerial may be greater than its linear dimensions at first sight would indicate; consequently a short wave condenser becomes an essential part of the receiving equipment.

For receiving apparatus, electrical connection is preferably made to the uppermost wire, which should be thoroughly cleaned and scraped at the point of contact. The earth connection may consist of a piece of gas pipe fifteen feet in length, driven into the earth as far as possible or, if feasible, the barbed wire of a second fence may be used as a counterpoise. It has been shown by experiment that when the receiving aerial is thus brought near the earth the directional characteristics are increased; hence it becomes important that the fence bear a definite relation to the sending station or signals will not, in some instances, be received.

Tests May Be Necessary

This type of aerial is in the main suited for the reception of the longer wave-lengths only and accordingly the receiving apparatus described in the article of this series which appeared in the July issue of The Wireless Age should be employed. A circuit diagram of the apparatus referred to was also published in the July issue. A series of tests may be necessary to secure results and the experimenter will be relieved of much anxiety if he will determine in advance the transmitting schedules of stations in his vicinity. It has been reported that a certain well-known wireless experimenter has received signals from across the Atlantic Ocean with an aerial of this type and the results compared quite favorably with a fair-sized standard aerial of considerable height.

Wireless in the Summer Camp

This is the season of the year when the average inland lake or river in the northern part of the United States is dotted with a number of summer camps under the direction of various boys' organizations. Among the members of these colonies there are invariably one or more wireless enthusiasts, and it is difficult to devise a better recreation for them than the installing of an amateur wireless telegraph set—particularly if another camp in the neighborhood possesses a radio equipment. The installation if employed to send invitations to entertainments, may become a useful feature in the social life of the neighborhood. Then, too, a well located station could be fitted with an especially sensitive receiving set capable of receiving press despatches during the night schedules of certain high power stations employed specifically for this service. The news thus received could be passed on from camp to camp until the folk for miles around were fully informed of the important events of the day. No matter how far from the bounds of civilization such camps are located, the foregoing suggestion is practical, provided certain phases of the wireless telegraph art are thoroughly understood.

In establishing communication between stations of unlike characteristics, some junior experimenters not thoroughly familiar with the fundamentals of the art, ignore the necessity for complete resonance between the transmitting and receiving apparatus. In support of this assertion the following incident is related:

The barbed wire fence can be used as an aerial

An aerial of small dimensions, having a total length of not more than thirty feet, was erected on two temporary twelve-foot masts fitted to a rowboat on a lake. It was intended to establish communication with the corresponding shore station in the tent of a certain summer camp. The aerial for the latter station was suspended in the trees and had such dimensions as to have a natural wave-length of about 300 meters. The wave-length of the boat equipment could not possibly have been more than forty meters.

A number of preliminary tests were made to ascertain the maximum distance that might be covered, but the results were anything but pleasing—in fact, the greatest distance at which the shore station could be heard was a half mile. At this point the sounds of the spark of the transmitting set at the shore station could be fairly distinguished, almost obviating the necessity for a receiving equipment.

Now, an aerial having a natural period as low as forty meters cannot be boosted by the addition of inductance to a value of 300 meters without a great sacrifice of efficiency; and by the reverse argument a 300-meter aerial is entirely unsuitable for the reception of signals from a forty-meter transmitting set. To redesign the aerials at both stations was, therefore, the only course open.

At this stage of development the writer arrived on the scene and, having been asked for advice, the following compromise was suggested:

Increasing the Range

The wave-length of the boat aerial was to be raised by a "loading coil" to approximately eighty meters and a second small aerial erected at the shore station to have, if possible, a similar wave-length. It is needless to say that when the suggested changes were effected the maximum range was increased to two and one-half miles, much to the satisfaction of all. By this and other experiments it is demonstrated that the phenomenon of electrical resonance in a wireless equipment is too vital to be ignored.

The simple wireless equipment installed in the rowboat was employed at a later period in a novel manner. A section of the lake referred to was well known as an excellent fishing ground, but like many members of the finny tribe, the appetites of the creatures of the water could only be tempted at certain periods, the latter being governed largely by the prevailing winds. The fishing ground was located about two and one-half miles from the summer mecca and it was customary for one or more of the local guides to row to the former each morning and, if possible, determine the degree of hunger shown by the fish. If conditions were favorable for fishing it was customary for the guides to hurry to camp at once and notify the anglers. It was not unusual, therefore, to see a variety of small craft headed for the fishing grounds.

Practical Amateur Wireless

It occurred to the owners of the wireless telegraph equipment that the installation could be used to good advantage in reporting to the summer colonists information regarding the prevailing conditions for catching the fish. Accordingly, after negotiations with the leading guides, the radio equipment was transferred to the master guide's boat. The experiment proved successful, the campers being promptly informed regarding the appetite of the fish. In a short time the little tent containing the wireless station became extremely popular, for in addition to the fishing service, nightly press bulletins were taken from a high-power station 300 miles away and distributed to all campers who could be reached.

This story should not be concluded without reciting the details of the capture of a fish in which radio telegraphy figured. Early one morning two junior members of the camp—the owners, by the way, of the wireless equipment—proceeded to the fishing grounds. Neither was experienced in the use of the rod and line. By a prearranged schedule a third member was to remain behind and to listen in at fifteen-minute intervals for wireless reports concerning their success or failure. At about the sixth the following message was re-

ceived at the shore station: "Send Bill out quick—got big one—think it is a whale."

Bill, an expert angler, hastened to the fishing grounds, where the tugging and pulling on the line, coupled with the vigorous splashing of the water, indicated that a fish of unusually large size had taken the bait. The reel was transferred to Bill and finally the coveted prize was landed. The catch proved to be a thirty-two pound German carp, which, as one of those present said, ordinarily could be "landed with a club." The fisherman agreed, however, that the carp owed its capture indirectly to the wireless telegraph set.

If the summer camp is located on an inland lake surrounded by mountains, the more adventurous members of the colony frequently wish to explore the wilder regions or perhaps climb the height of a distant peak. However, there is always the danger of being lost or of unforeseen circumstances preventing the return to camp. If the latter is equipped with an amateur wireless telegraph equipment and, furthermore, if one of the campers can be induced to remain to operate it the members of the exploring party may take a portable equipment with them and report to their companion.

Transportation Suggestions

The wireless telegraph set of an amateur exploration party need not be cumbersome, bulky nor difficult to transport. For example, the complete equipment should be made up of several individual units which may be divided between the members of the party. Thus A carries on his back the aerial which, by the way, consists of two coils of aluminum wire, each 150 feet in length, fitted with simple porcelain cleats to serve as insulators. He also carries sixty square feet of galvanized "chicken wire netting" to act as an earth connection or counterpoise. B takes a three or four-inch spark coil strapped to his back and on account of the weight of same it is shifted to other members of the party at certain intervals. C carries six dry cells for operation of the coil, while D carries a similar number. To E is entrusted the care of the receiving equipment, which, if properly designed, will have little weight. He also carries the head telephones and the transmitting key. It need not be added that much of this equipment may be placed in the ordinary duffle bag of the explorer, care being taken not to injure the more delicate parts of the equipment.

Aerial in Trees

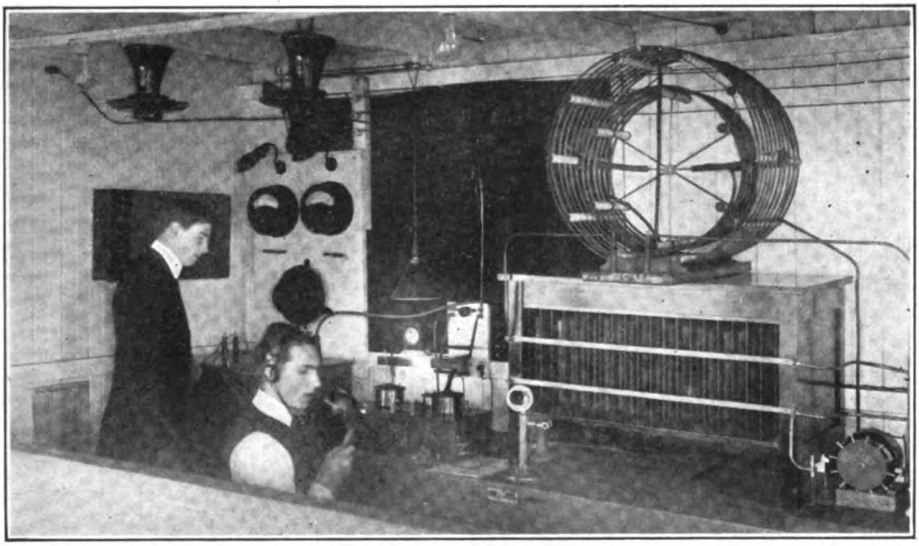
The aerial of the party should be strung in trees, selecting those which are located in a clear space and having a generally unobstructed view in the direction it is desired to transmit. If possible a counterpoise may be thrown in a creek, thus making a more perfect earth connection. To balance matters up it is further recommended that the receiving station at the camp be fitted with a sensitive vacuum valve detector in order that the distance of a few miles may be covered with ease.

One of the most obvious errors of the amateur is manifested in the design of a receiving tuner for the shorter range of wave-lengths which often, while primarily intended for amateur receiving work, will upon measurement show a possible wave-length adjustment of 3,000 meters. The natural period of such a winding may be in the vicinity of 2,000 meters, and consequently a good portion of the available energy is lost in the dead-ends.

A receiving tuner for crystalline or vacuum valve detectors should be so designed that for a given wave-length inductance predominates in the secondary winding and the capacity in shunt is at a minimum value. This line of argument, however, cannot be carried out indefinitely because at very long wave-lengths the resistance of the coil may offset the benefits of increased inductance; but within the range of wave-lengths amateurs ordinarily employ the capacity of the secondary condenser should never exceed 0.0001 microfarad and is preferably smaller. Another error often observed is that the used turns of the secondary winding when adjusted to 200 meters cannot be placed in close inductive relation to the used turns of the primary winding.

(To be continued)

With the Amateurs



Earl Hanson and Hadys Hancock in their station at Venice, Cal.

An accompanying photograph shows Earl Hanson and Hadys Hancock operating the amateur wireless telephone and telegraph station on the pier at Venice, Cal.

Particular interest is attached to this amateur station, for it was here that Lawrence A. Prudhont, the hero of the wreck of the steamship Rosecrans, whose name will be reverenced as long as the Marconi Tradition, spent many hours sending and receiving messages. A considerable knowledge of the technique of radio communication was his before he left to attend the Marconi school.

A 5 k. w. closed core transformer is installed in this Venice station, but to comply with the law only one k. w. is used. The rotary gap, condenser and oscillation transformer is wired with copper tubing to carry the high frequency currents efficiently. The receiving set is a combination set for short and long wave reception.

The aerial is composed of stranded 7-22 phosphor bronze, is 300 feet long and 100 feet high for receiving and the earth plates are plunged in the ocean beneath the station. A 200 meter wave is used for transmitting.

A large picture of Lawrence Prudhont still hangs in this station.

An interesting amateur equipment in New York is the one which the owners term the Atlantic Radio Station, but is known to the government and wireless public as simple 2GT. Its interest lies mainly in the long record of service, and the apparatus used. All apparatus was built and designed by three young men. The receiving cabinet is of the latest

Marconi type, made entirely of hard rubber. The measurements are: Length, 19½ inches; width, 10½ inches, and height, 13 inches.

The loose coupler is an efficient and simple piece of apparatus. The secondary moves on wheels and is controlled by a knob on the face of the cabinet. The coupler can tune up to 5,000 meters alone. All taps, primary and secondary, are on the face of the cabinet. These taps also indicate the number of turns being used. The primary coil is so arranged that 1, 2, 3, etc., turns can be used. With the use of the loading coil the set can be tuned up to 8,000 meters.

Two variables are used. These condensers are made of brass, one in series with the ground to reduce the natural wave length of the aerial to that of the amateur wave. The other condenser is shunted across the secondary. These condensers can be placed at any angle and will stay in the position desired.

The detectors are three in number—silicon, antimony and valve, the two former being switched into the circuit by a single pole double throw switch. The valve is operated by two telephone switches, one to light the filament and the other to restore the circuit for the crystal detector. The high voltage batteries are switched into circuit one at a time by a switch on the cabinet. All batteries, buzzer tester, etc., are in the separately constructed compartments of fibre.

The aerial is of the inverted L type, 250 feet long, three wires, spaced three feet apart. Phosphor bronze wire of seven strands is used, 90 feet high on the receiving end and 125 feet on the free end. With this set all the Navy stations down NAX can be heard and also some of the Canadian stations.

Station 2GT, which has an excellent record in the amateur field

Many amateurs have trouble in getting alternating current to operate their sending sets; this station uses a rotary converter of the four pole type, started by a rheostat. The speed of the converter is controlled by a resistance in the field circuit. The normal

speed is 1,800 r.p.m., but with the resistance in the circuit the speed is 3,000 r.p.m. The rate is under control of the operator, and the generator is usually run to get 240 cycles. There is a Packard closed core transformer type giving 13,000 volts. A safety gap is used to protect the condenser, which is of the flat plate type containing 24 plates. There is no brush discharge as in the rack type. The gaps are rotary, quenched and straight gap, the rotary disc having 12 plugs of zinc. The quenched gap consists of 7 copper plates separated by mica rings, operating the transformer on 240 cycles; it emits a steady pitched sound similar to that of escaping steam. A pair of Weston volt and ammeters are constantly in the circuit and notify the operator when he is near the danger point of overloading the line.

For the past four years this station has been doing excellent work to the great satisfaction of the three young men who are joint owners and builders of all the apparatus.

Seeing Ourselves as Others See Us

My words cannot express my appreciation and praise for your most excellent magazine and I earnestly recommend it to everyone interested in wireless communication. Wishing the paper everlasting success, I remain.

C. W. H., *Ohio.*

I would not be without The Wireless Age and look forward to same every issue.

W. O. H., *Tennessee.*

I like The Wireless Age very much. I think you have the best magazine I ever read.

S. L. H., *Michigan.*

I have taken The Wireless Age for the last few years and I think it is the only magazine on wireless that I would bother to read.

H. J. M., *Connecticut.*

I think The Wireless Age is the best magazine going, and do not know what I would do without it.

E. G., *New York.*

Your publication contains so much "good stuff" that I find when I lend an issue out, it seldom comes back. And if it does come back, it is in such a dilapidated condition that it is necessary to send for another copy.

J. E. B., *California.*

I could not get along without The Wireless Age at all. Best wishes for continued growth.

C. M. B., *Pennsylvania.*

I am a constant reader of The Wireless Age and think it high authority on wireless. The Wireless Age and I will be friends in future years.

H. W. H., *California.*

I am sending my renewal subscriptioin for The Wireless Age. Please send me the July number, because I do not care to miss any numbers. I get more real pleasure from it than any other magazine I read.

A. C. W., *Iowa.*

Every new issue solves the question I intend to ask.

R. V. M., *New York.*

From and For those who help themselves

Experimenters' Experiences.

The editor of this department will give preferential attention to contributions from amateurs covering the design of transmitting sets, wave-meters, etc. There is an over-supply of material on receiving tuners, particularly "loose-couplers," the designs for the majority of which present nothing new or original.

FIRST PRIZE, TEN DOLLARS

Primary Switch for the Inductively Coupled Receiving Tuner

I recently designed a new form of switch for variation of the inductance in the primary winding of a receiving tranformer which possesses many advantages, the principal one being that it allows very quick and accurate tuning, doing away with the necessity for manipulating two switch handles which are generally used on these tuners. The general details of construction are apparent from the drawing (Fig. 1), from which it will be observed that a single handle controls both the "units" and "tens" switch by means of gears having a certain definite ratio.

In the particular type of construction shown, the larger gear is ten times that of the smaller one, so that when the "tens" switch is moved one point the "units" switch covers the ten points, which are connected to ten individual turns. Thus, by giving the handle a complete turn any number of turns of the primary winding from 1 to 100 may be included in that circuit. However, if gears of different ratio are used the switch may be constructed to include any desired number of turns.

A cross section of the large switch is shown in Fig. 3, the small one being left out to avoid confusion.

Dimensions of the details of this apparatus are not given, as each amateur will, without doubt, have his own ideas regarding the matter. If the proper size gears are not readily obtainable, with a little patience they may be constructed out of a piece of sheet brass with a file.

The contacts of the larger switch are made by dividing a brass ring ¼ of an inch in width and 1/16 of an inch in thickness into ten equal parts. They are then sawed off. A hole is bored and countersunk into each contact so that the flat-headed screws will just come flush with the contact.

The taps from the coil may be placed through holes in the board and connected under each contact. However, if flat-headed machine screws are used this will not be necessary. A good plan is to bore all the holes, marking their position on the board before sawing off the contacts, as it may be difficult to arrange them properly afterwards, particularly if the holes are not bored accurately.

The smaller switch has the contacts ordinarily employed in switch construction. The switch blades may be made of thin brass, the larger one having a small dent near the end so it will not touch two contacts at a time.

The handle may be of any material desired, but I prefer one of a large piece of hard rubber.

The bearings for the large switch should be of ⅛ inch brass set in the

board, as shown in Fig. 3. Washers of ample size are placed under the handle and gears. One of the gears should be insulated from the shaft; otherwise the primary winding will be short-circuited.

A complete wiring diagram is shown in Fig. 4. The first ten turns are connected, one at a time, to the small switch ("units" switch) and every successive tenth turn to the large switch. One switch blade is connected to the aerial and the other to the ground.

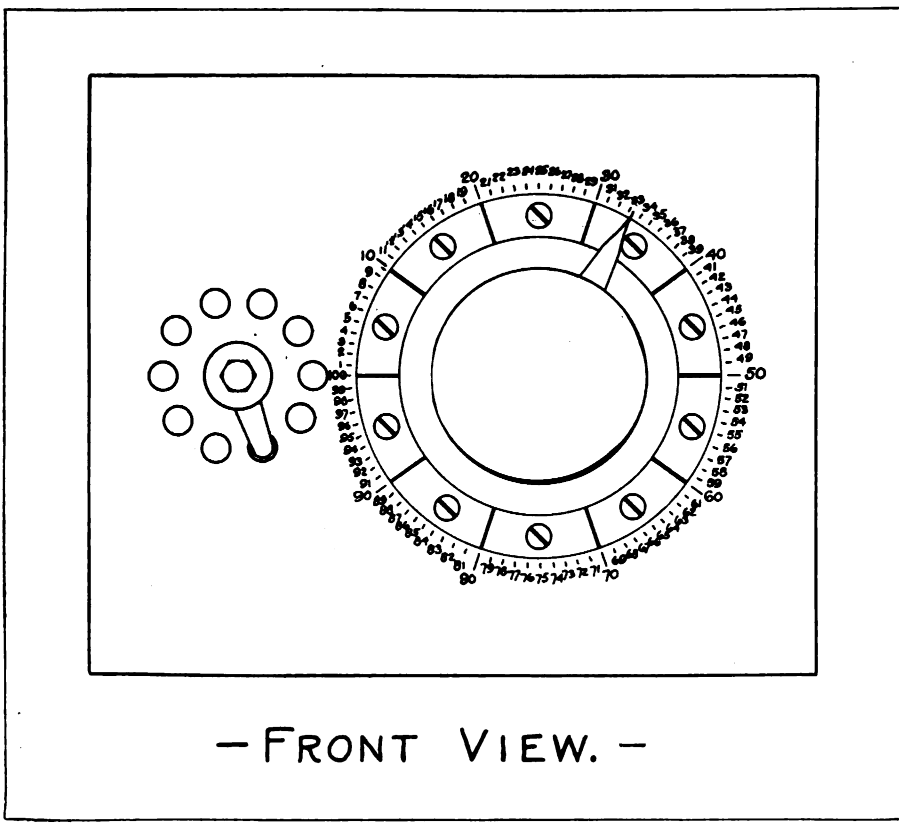


Fig. 1, First Prize Article

In conclusion I might mention that before assembling the gears both switch blades should be on contact No. 1. A suitable scale may be constructed for this switch.

If the general directions are followed the entire apparatus may be constructed at small cost and I am sure will be found entirely practical in operation.

C. HAROLD McCULLOUGH, *California.*

SECOND PRIZE, FIVE DOLLARS

An Efficient 200-Meter Transmitting Set

In this article I present to the readers of THE WIRELESS AGE the description of an amateur wireless telegraph set with which I have obtained very gratifying results. The drawings are, to some extent, self-explanatory, but will probably become clearer from the following explanation:

The transformer should be mounted in a wooden case of such dimensions that the remaining instruments comprising the set may be mounted on the top. The condenser, which consists of six 8 by 10 photographic plates covered with tinfoil 6 by 8 inches on each side, should be mounted at one end of the case with the leads terminating at one corner near to the rotary gap, as shown in the drawing. The rotary gap should be mounted fac-

ing the condenser and as close as possible in order that the connecting leads may be of a minimum length.

The primary winding of the oscillation transformer consists of one turn of 1 by

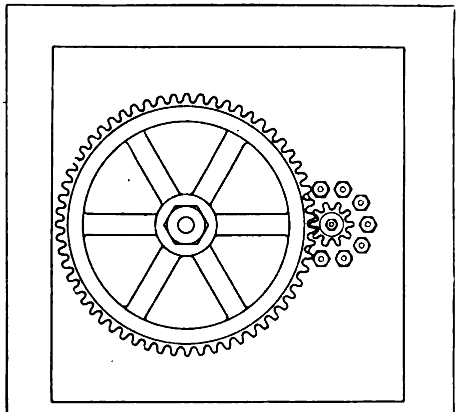


Fig. 2, First Prize Article

1/32 inches copper ribbon, 8 inches in diameter with the terminals at the bottom of sufficient length to be used for further connection without splicing.

The oscillating circuit is then connected up as follows: From one terminal of the condenser a connection is made to one of the stationary leads of the gap. This lead need not be more than 3 inches in length. Then one end of the primary strip is connected to the other terminal of the condenser. From the bottom of the single turn to the condenser there should be a space of more than 3 inches. The other end of the strip is connected to the other terminal of the gap; a space of 4 inches should intervene from the bottom of the turn to the gap. It is desirable to use the same strip for the connection from the primary to the condenser and spark gap, as two joints are thereby eliminated. Furthermore, connection of the leads to the top of the rotary gap removes the necessity for posts of considerable length which is of course undesirable. The total length of the leads in this circuit, including the diameter of the rotary wheel, need not be more than 15 or 16 inches.

It must be remembered that appearances are sometimes deceptive and the leads in a circuit may seem to be considerably shorter than they actually are. Thus the leads to the condenser must be measured to the point where they touch the coating and not merely to the edge of the glass or to the top of the case. Also, the material in the circuit of the rotary gap, such as the uprights, stationary electrodes, etc., must be taken into consideration as effecting the length of the leads in the closed circuit.

The secondary winding of the oscillation transformer consists of five turns of the same kind of ribbon and is arranged to move backward and forward so as to allow the coupling between the two windings to be varied.

I wish to include in this manuscript the description of a practical break-in system. The method to be described has been evolved by the author after making a number of experiments to produce a satisfactory piece of apparatus.

In the design for a break-in system several important matters must be taken

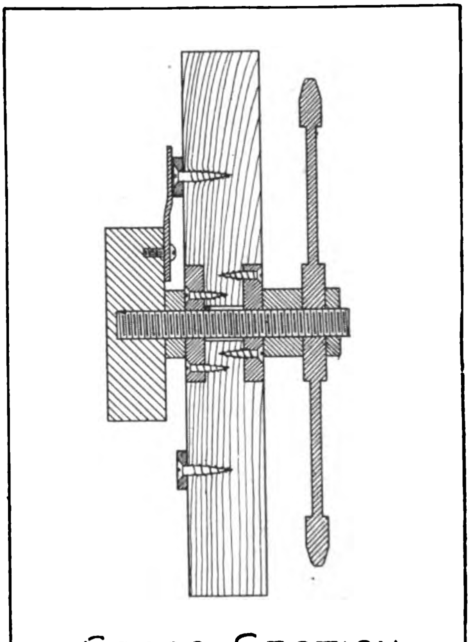


Fig. 3, First Prize Article

into consideration; the most important one is the retention of the sensitive adjustment of the receiving detector. Obviously, no system may be rightfully termed a break-in system or have the slightest value as such if the detector

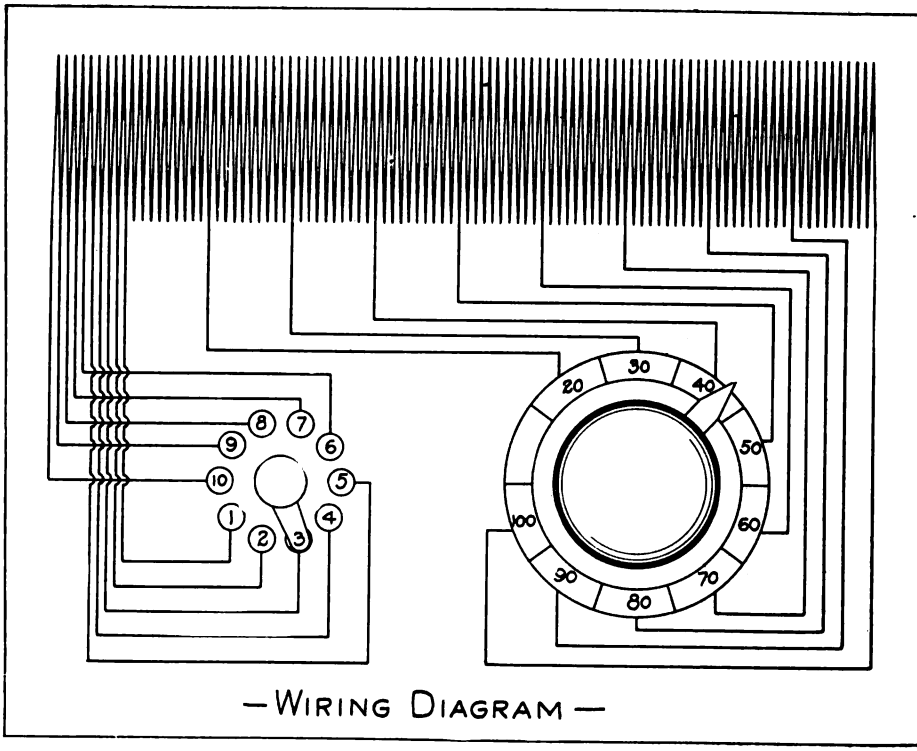


Fig. 4, First Prize Article

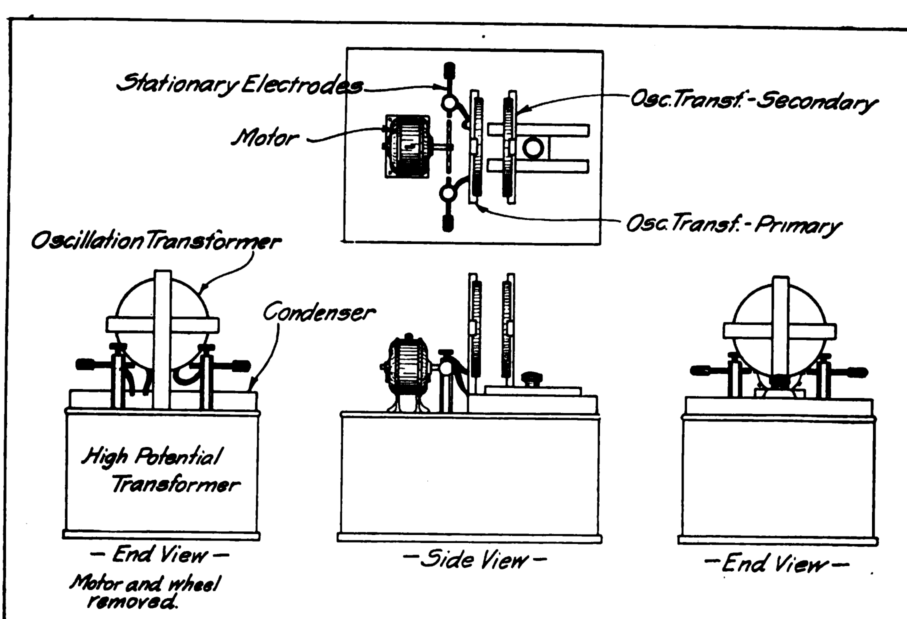


Fig. 1, Second Prize Article

loses its adjustment the first time the sending key is pressed.

With a vacuum valve detector this problem is easily solved by simply breaking the filament circuit through the medium of a telegraphic relay just before the power circuit is closed by the key. The difficulty, however, is not so readily obviated with the crystal detector, excepting, of course, the crystal of carborundum; but as few amateurs use the carborundum detector it becomes necessary to provide means for keeping a delicate adjustment with a silicon or galena crystal. However, it may be stated that a good carborundum crystal properly used will give very satisfactory results. With the silicon or galena detectors, which probably rank together in popularity and general use, I have found that the only satisfactory method to retain a sensitive adjustment is to completely isolate the detector from all circuits and then place it on short circuit, as close to the crystal as possible. As will be seen later, this can easily be done automatically.

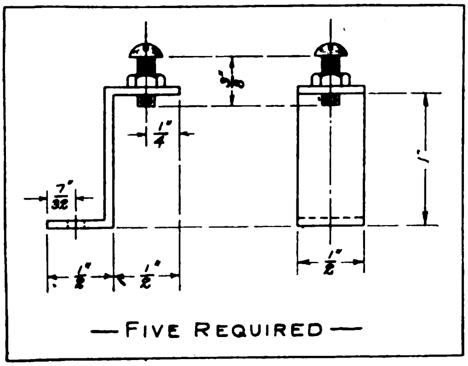


Fig. 2, Second Prize Article

The second consideration is that of the flexibility of the system as regards speed in sending. Systems using groups of contacts mounted upon extended key levers have the great disadvantage of making the key very stiff and sluggish in its action. Also they bring the high-tension transmitting leads in proximity to the receiving leads which is, of course, very undesirable.

Other points may arise in the design of a break-in system, but they are usually due to local conditions which vary, of course, with different stations.

In some systems an anchor gap is inserted in the earth lead and the receiving set is bridged around its terminals. Personally I have found this method very unsatisfactory because no matter how close the points in the gap are set a considerable amount of current flows through the receiving apparatus which is usually of sufficient intensity to destroy the adjustment of the detector. The gap also introduces an objectionable resistance in the radiating circuit which may hinder full compliance with the United States radio laws.

In my experiments with similar systems I could never prevent the sending current from destroying the adjustment of the detector except by short-circuiting the primary winding of the receiving tuner, or in other words, connecting the sending set directly to earth. I find this, by all means, the most satisfactory method if additional means are provided for disconnecting the leads of the receiving apparatus and connecting the transmitting apparatus direct to the earth; no gap of any kind is used.

The system I have evolved consists of nothing more than two D. P. D. T. switches mounted so that they work automatically together, one connecting the receiving set to the aerial and the ground; the other simultaneously connecting the detector to the receiving circuit. In the other position the first switch disconnects the receiving circuits, leaving them isolated from all high tension wires, and connects the sending set directly to the earth. At the same time the other switch has disconnected both leads to the detector and short-circuited it. More than one detector stand can easily be used, all of them being disconnected from the receiving set, but

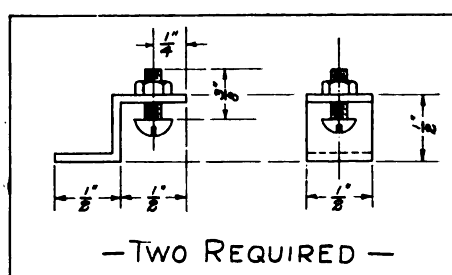
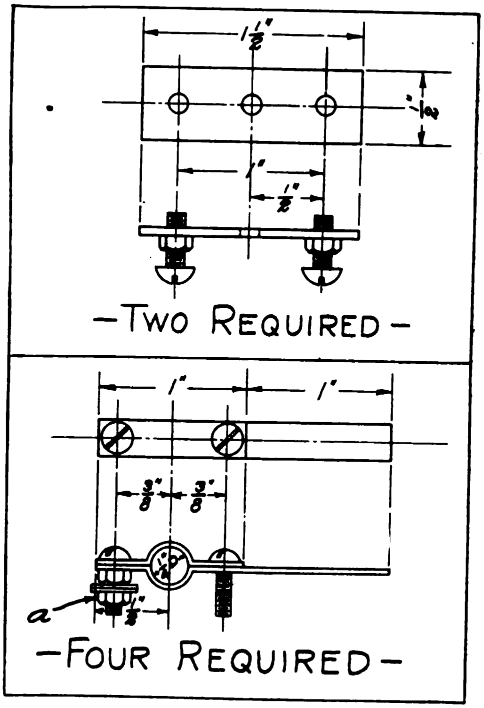


Fig. 3, Second Prize Article

only the one actually in use can conveniently be shorted.

In Fig. 11 A represents the first switch, B the second switch and C the operating magnet and armature. These three elements are mounted on a light fibre or wooden rod about ¼ of an inch in diameter and as long as necessary to conform with the following desirable restrictions: The ground lead should be made as short and direct as possible from the transmitting instruments to the ground. The rod should then be so mounted that the switch, A, will be as close to the wire as possible. The leads to the receiving set should preferably be at right angles to the ground lead.



Figs. 4 and 5, Second Prize Article

It is desirable in any wireless station that the transmitting instruments should be grouped together as closely as possible; but it is absolutely essential in an amateur station if any degree of efficiency is to be expected. The receiving instruments should also be compactly arranged and should be connected with stranded wire soldered at all joints. The receiving set ought to be at least three feet from the transmitting instruments and even farther if convenient.

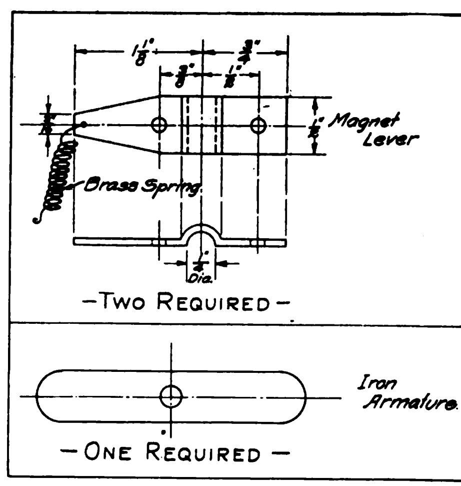
The switch, B, should be mounted near the receiving set and as close to the detector as possible. As there is no jarring in the action of this switch it is possible to mount it quite near the detector without throwing it out of adjustment.

The magnet, C, may be mounted at any point along the rod as convenient. It is shown in the sketch as being placed at one end merely for the sake of clearness.

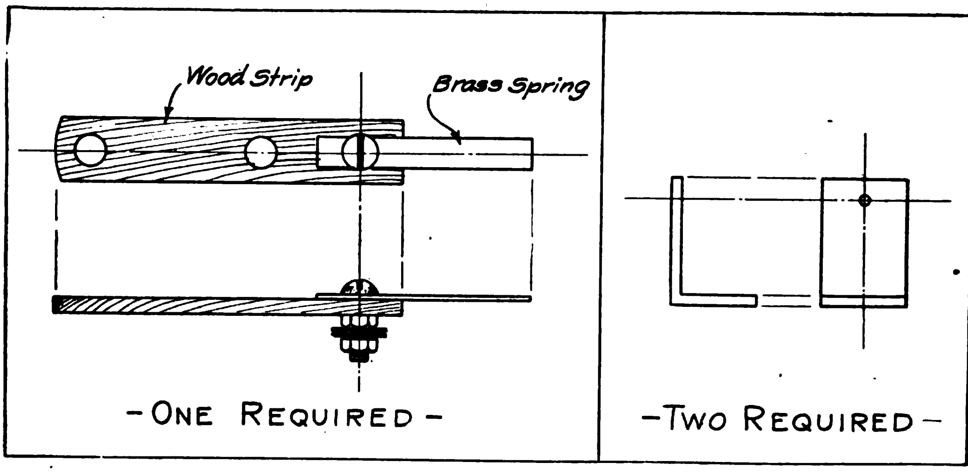
Figs. 2 to 5 give the details of the switches and Fig. 10 gives an idea of the appearance when assembled. Both switches are identical in construction:

Figs. 6 and 7 give the details of the magnet armature lever. The iron armature is bolted to the short end of the lever and a spring is attached to the other.

Fig. 8 illustrates one method of constructing a suitable attachment to the key. It is nothing more than a piece of wood drilled so that it may be clamped to the key lever by means of the lock nut to the stop screw and the tension screw. A bracket (Fig. 2), is mounted beside the key so that when the key is pressed the attached spring will make contact with the contact screw of the bracket just before the power circuit is closed. This action will not make the key act stiffly or sluggishly in any manner and sending may be done at the speed desired. Fig. 9 shows suitable brackets in which to mount the rod. A small



Figs. 6 and 7, Second Prize Article



Figs. 8 and 9, Second Prize Article

wire nail driven into the end of the rod through a small hole in the bracket provides a practically frictionless bearing. The advantage of this type of switch is that there is no group of contacts mounted on the key to stiffen its action and necessitate wide "play." The sending and receiving leads are not brought into close proximity and if properly constructed the action of the device is practically noiseless, thereby permitting the operator at a far distant station to break in upon the sending operator at your station.

General Instructions.

If trouble is experienced from noise and vibration of the rotary gap motor, hang it from the ceiling by cord. This is not so foolish as it seems at first, for by so doing practically all noise from the motor as well as vibration of the instrument table is eliminated. If a cabinet transmitter is employed, suspend the entire case.

In one instance the suspension of the rotary gap from the ceiling made it possible to reduce the length of leads in the primary circuit by 11 inches, thereby permitting the use of an extra condenser plate which, of course, resulted in increased absorption of power, while still not increasing the wave-length.

The magnets used in my device may be taken from a 20-ohm telegraph sounder. Two dry cells are quite sufficient to operate the break-in and should last for several months. The armature is fastened on the short end of the lever so as to provide a speedy action to keep pace with any rapid sending. A spring is attached to the long end of this lever so as to draw the switch back to the receiving position. The play between the contacts is represented in Fig. 10 to be about 3/16 of an inch. When the play is so adjusted, the armature has only to move 1/16 of an inch to change from receiving to sending.

The springs used for the switch arms should be made of a good grade of spring brass, heavy enough so that they will not vibrate when they are moved.

A convenient size for all bolts and taps is 8-32. The brackets may be of ½-inch strip brass 1/16 of an inch in thickness, but any other size may be employed, provided it is heavy enough so that it may be easily bent, drilled and tapped.

The cost of construction for such a switch is very small. In general it is found that material is available at any amateur work shop.

With a switch of similar design, mounted under the table in a station where the sending instruments were at the operator's right and the receiving instruments at his left, and with the ground lead going directly through the floor, I was able to hear Key West, 1,300 miles, while transmitting to an amateur near by at every interval between the dots and dashes of my sending. As the ground lead was vertical and the leads to the receiving set were horizontal no trouble was experienced from induction.

The aerial was 80 feet in length by 50 feet in height comprising two wires, and the receiving set consisted of a simple inductive tuner used in conjunction with a Silicon detector.

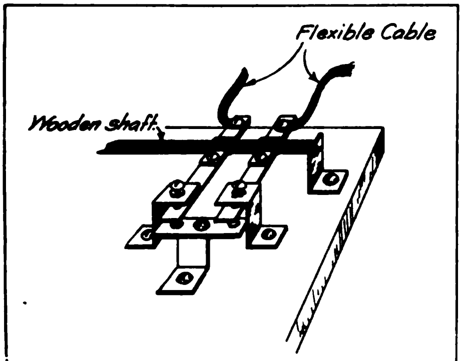


Fig. 10, Second Prize Article

James A. Kilton, Jr., *Texas.*

THIRD PRIZE, THREE DOLLARS
A Synchronous Rotary Spark Gap

Many amateur workers are prevented from fitting their stations with a synchronous rotary spark gap on account of the expense of a satisfactory motor. The design which we present for consideration is not entirely original with ourselves, but was suggested by Professor A. S. Jordan, of the physics department of the Polytechnic High School of San Francisco. The design of this motor is rather unique, but we are certain that it will appeal to the amateur experimenter who lacks the necessary funds for one of standard make.

So far as we can see, the only disadvantage of this motor is that it is not self-starting, *i. e.*, the rotor must be first revolved by some mechanical means. For example, we suggest that a small pulley be fastened to the shaft and by means of a piece of string wound around this pulley a few preliminary turns may be given after the manner of winding up a toy gyroscope. The current being turned on at the field magnet the rotor will continue in rotation at a very high speed. It should be remembered that this gap will give synchronous discharges at a frequency of 60 cycles and therefore the note may not be quite as high as that obtained with certain types of non-synchronous gaps.

A top view of the complete rotary gap is given in Fig. 1, a side view in Fig. 2 and details of construction in Fig. 3.

The field magnets must be of fairly large proportions to obtain efficient results, and the core must be laminated or built up of many thin sheets of soft iron insulated from each other. The electro magnets should be wound with about No. 24 D. C. C. wire. A suitable impedance or reactance coil should be constructed and connected in series with the field coil, as it is not possible to operate such a small coil directly on a 110-volt alternating current circuit.

No descriptions of the details of the bearings are given, as materials, such as the bar magnet, etc., may be found in the amateur's work shop. The bearings are very simple in construction and, with a little ingenuity, the entire gap can be constructed of odds and ends. On the outer ends of the bearings is located the rotary spark gap proper. The electrodes are two in number and are insulated from the shaft by means of a rubber bar. Both electrodes must be connected together by means of a piece of wire.

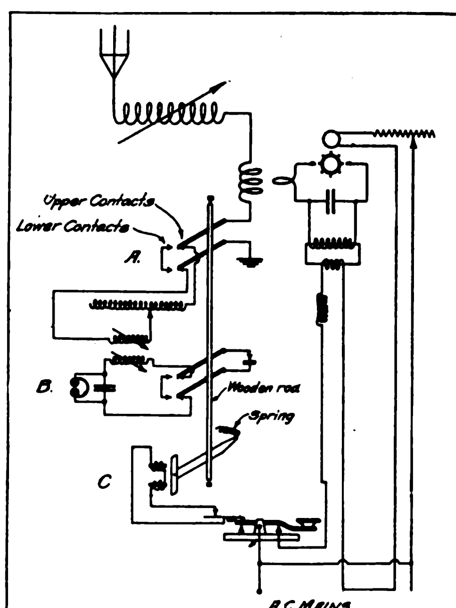


Fig. 11, Second Prize Article

The rotor of this motor is a fairly large, but strongly magnetized steel bar magnet. There should be a very small

clearance between the ends of the coils and the poles of the magnet.

The stationary electrodes may be taken from any ordinary type of straight spark gap, the binding post for supporting them being separated by the necessary distance according to the design.

We believe that the details of construction will be readily understood from the drawings and, if the general directions given are followed, a very useful and satisfactory piece of apparatus for your station will result.

E. G. Mahn, Walter Maynes, *California.*

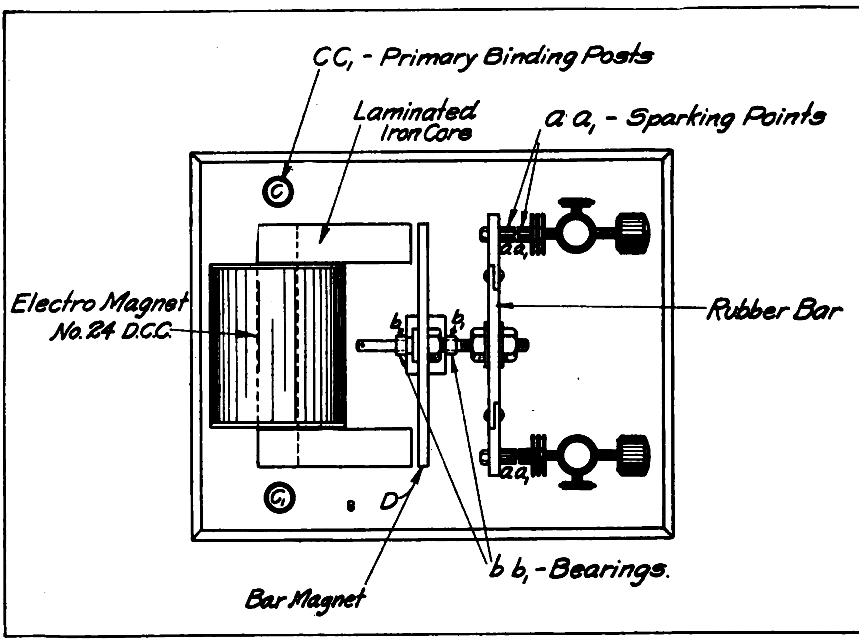


Fig. 1, Third Prize Article

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE

A ½-k.w. Amateur Transformer

If the proper directions were available many amateurs would construct their own high potential transformers. If they live in a town where 30-cycle current only can be obtained, they may find it difficult to procure the necessary data. The following described transformer was specifically designed for 30-cycle alternating current, but has been found to work equally well on 60-cycle current.

The details of a suitable winding machine to take care of the secondary "pies" are shown in Fig. 1, while a general idea of the transformer frame is given in Fig. 2. A schematic drawing of the primary winding is shown in Fig. 3.

The core is made from 28 gauge stove pipe iron, which is generally procurable from the scrap at any tinsmith's store. The following pieces are required: 126 pieces 2 inches in width by 12 inches in length; 126 pieces 2 by 9 inches; 126 pieces 2 by 8 inches, and 126 pieces 2 by 5 inches. The 12-inch and 9-inch pieces should be shellacked on both sides.

The long legs of the frame are made by stacking 63 pieces 2 by 12 inches and 63 pieces 2 by 8 inches. First a 2 by 12-inch piece and then a 2 by 8-inch piece is placed in position. The 2 by 8-inch pieces are placed so that the 2 by 12-inch pieces will overlap them 2 inches on each end.

These legs should now be clamped together tight enough to make a pile about 2½ inches in height. This can be done by using two iron clamps after which the legs are bound with two layers of ordinary friction tape. In this manner the laminations will be held tightly together. The height of the pile can be

maintained by moving one clamp at a time. Two inches at each end of the core are not to be covered with the tape. The center of each leg is now covered with ten layers of Empire cloth. The primary winding, which consists of four layers of No. 13 D. C. C. magnet wire, is wound on one of the legs. This winding will require 4½ pounds of the wire

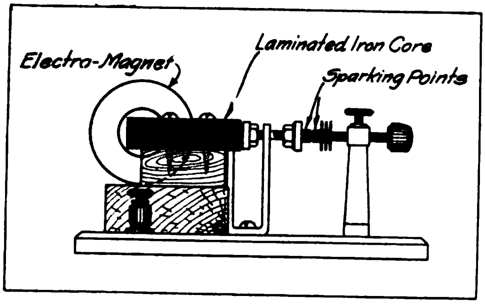


Fig. 2, Third Prize Article

referred to. Starting 2½ inches from the end wind two layers of 80 turns each, and two layers of 75 turns each. Taps are taken off from the second, third and fourth layers, as shown in Fig. 3. In this manner the secondary voltage may be varied as desired. The secondary winding is made up of twelve pies about ½-inch in thickness, each pie having 2,350 turns of wire. The total winding will require 7 pounds of No. 32 black enameled wire.

These pies are made in the following manner: A form is cut from a block of wood about ½-inch thick to the size of the core outside of the Empire cloth. A flange is fastened to one side of the block so as to overlap each edge about 2½ inches. The foundation for each pie is made of a piece of cardboard ½-inch wide, which is wound around the block. For a distance of ¼ of an inch in the center of this strip wind 20 turns of wire, which is covered with a ½-inch strip of thin onion skin paper, glazed on both sides. This is followed by 20 additional turns of wire and another strip of paper until 2,350 turns of wire are wound on each pie. The pies are now taped tight enough to keep the layers in place, and then placed in boiling paraffine wax for about half an hour.

The pies are now placed on the leg with two pieces of Empire cloth between each pie where they are connected from the inside and one piece where they are connected from the outside.

Care should be taken that the pies are so placed that the current will travel in the same direction around the entire core. If the pies are all wound in the same direction and every other pie is reversed as it is being placed on the core, the maker will have little difficulty in effecting the proper connection.

The two long legs are now joined together by the short pieces (2 by 9 inches and 2 by 5 inches). The long pieces should span the full width of the core, while the short pieces will go between the long legs. The short legs are clamped and bound with two layers of friction tape.

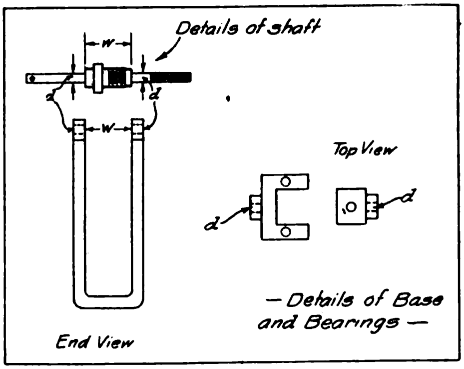


Fig. 3, Third Prize Article

The transformer is then placed into a metal box and covered with transformer oil. Care should be taken to see that the box is large enough so that no portion of the transformer will touch the sides.

When the full four layers of the primary winding are used this transformer will furnish a secondary potential of about 12,000 volts. The spark produced is not the kind of spark given off by a spark coil, but is a flame sufficient to make needle points red hot for a distance of 1 inch from the tip.

If the builder of this transformer will make use of the winding machine shown in Fig. 1 he will have little difficulty in making the secondary coils. The construction is as follows:

Cut enough pieces of cardboard, 2 inches, 2½ inches, 3½ inches and 5 inches in diameter to make four wheels

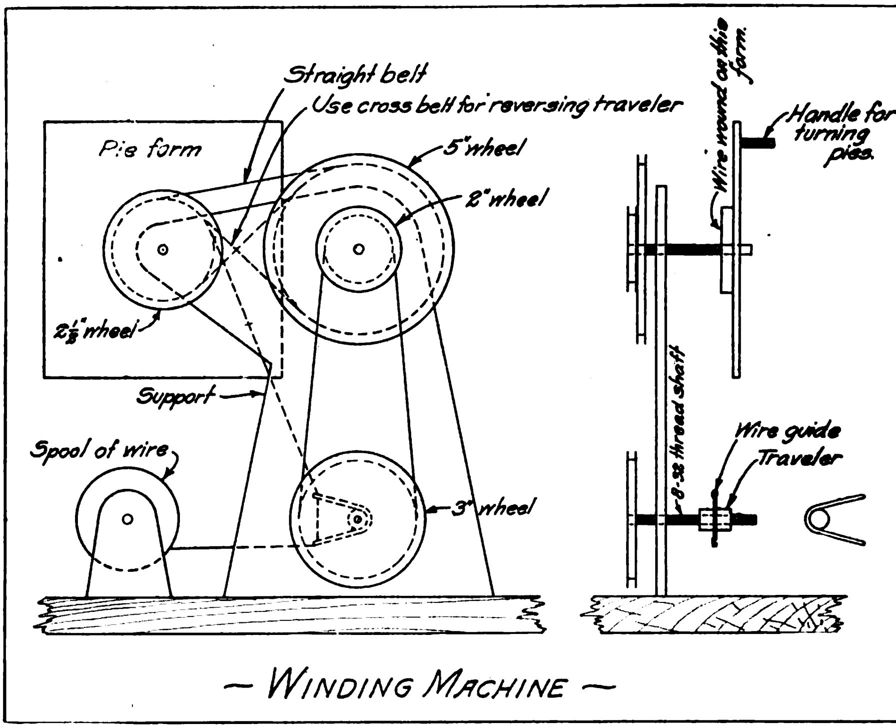


Fig. 1, Fourth Prize Article

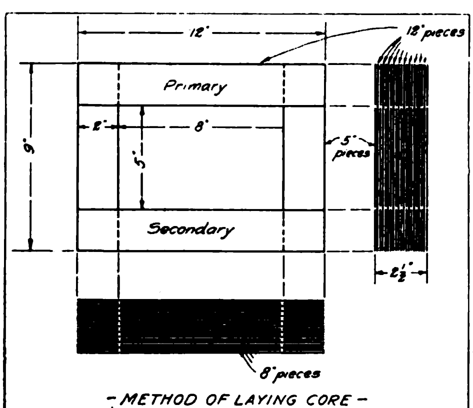


Fig. 2, Fourth Prize Article

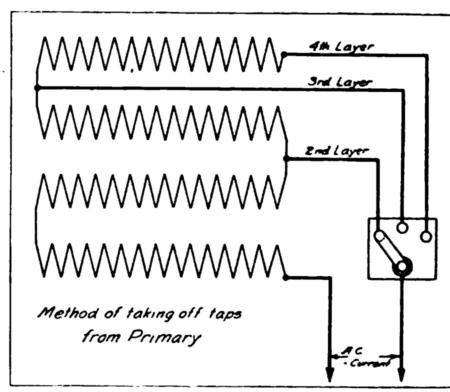


Fig. 3, Fourth Prize Article

about ⅛ of an inch thick. Then cut two pieces each 2½ inches, 3 inches, 4 inches and 5½ inches in diameter and glue them to the wheels for flanges. The 2-inch and 5-inch wheels are glued together and mounted on the same shaft; the 3½-inch wheel is mounted on a shaft which is cut with an 8/32 thread.

A small traveler is tapped out with an 8/32 thread so that it will work on the shaft. Two string belts will be required to go from the 2½-inch wheel to the 5-inch wheel. One is straight and the other is crossed so that the pie will turn in the same direction, but the traveler will work back and forth. I believe this explanation is sufficient to allow construction on the part of many amateurs and I feel assured that they will be satisfied with the operating characteristics of this transformer.

JAMES E. MACGREGOR, *Michigan.*

RADIO RAVINGS

Conducted by D. Phecriff Inslater

Scene: Marconi Superintendent's office, any division, morning of the millennium. (B. McLean, impresario.)

Amateur: "Have you any vacancies at the present time, sir?"

Chief Operator: "Well, what can you do? You, of course, have sent and received messages at least five thousand miles?"

Amateur: "No, sir — have never worked that far."

Chief: "But surely you know all about wireless and can draw a diagram of every system in existence?"

Amateur: "No, sir; I've got a fair knowledge of wireless, but don't claim to know it all."

Chief: "Then without a doubt you can send and receive at least 40 words per minute?"

Amateur: "No, sir; I couldn't work that fast, but think I could handle about 25 words O. K."

Chief: "Then surely you see where the Service could be improved in many ways and can install apparatus more neatly than our construction department?"

Amateur: "No, sir; while I have seen and heard a number of your stations work, I have no fault to find. In fact, I think I've got considerable to learn before I would feel able to make any criticism."

Chief: "Then at least you can furnish forty recommendations from the leading citizens of your community regarding your ability and character, and if given a position, you, of course, would expect the best job we have?"

Amateur: "No, sir; I have only my high school diploma and a letter of introduction from our superintendent of schools. Will take any position you give me and if given a chance, will do the best I can."

Chief Operator, showing signs of immediate departure by fainting route, gasps incredulously and reaches feebly for glass of ice water. Said g. of i. w. externally applied, revives him and he stutters weakly: "Come back at two this afternoon. Consider yourself assigned to the steamship Veritas, leaving Pier 61 at four-thirty."

SONG OF THE SUBMARINE

If X-4-11-44
Should bump the Hully-G
Do you suppose her gallant op
Would, quick, forsake the sea?
"I doubt it," says Repeater, "for
'Tis there I think he'd be."

Can you send me a sample copy free?—*Letter from Henry Byer.*

With the very greatest pleasure
  I do what you desire,
No pay I'd think to take for it
  Although you are a Byer.

Striking a tune on the lyre seems to be the pleasantest of indoor sports these sultry days when clothing manufacturers are patriotically advising us to stick to clothes made in U. S. A.

Merely to show that nothing is worse than verse, lamp these:

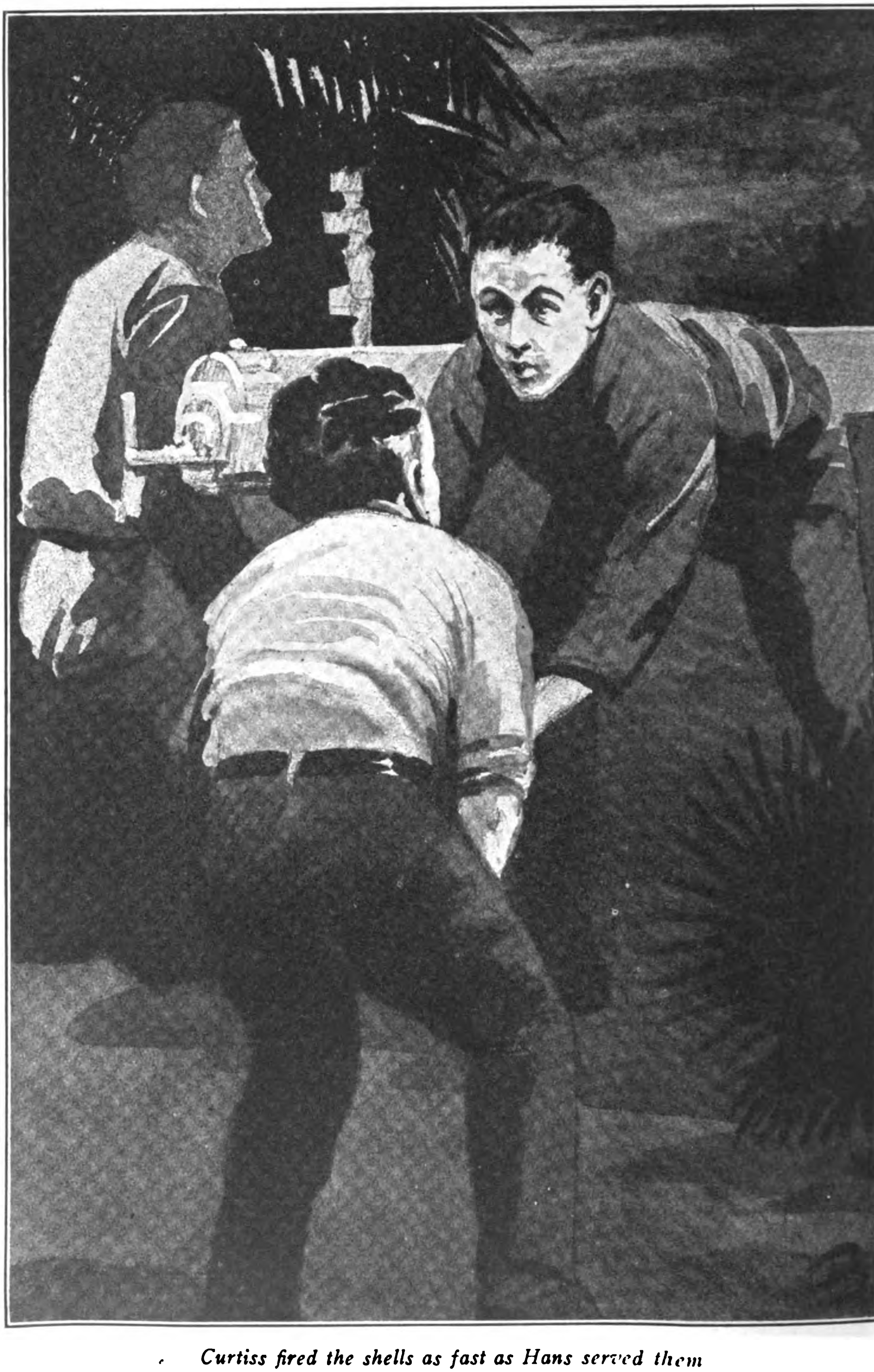
Mary had a little lamb,
  And a piece of pie or so;
But Mary did not have them
  When the ship tossed to and fro.

Mary had a plate of soup,
  Some cabbage and fried pork—
But Mary missed them strangely
  Just two hours from New York.

And just to think that Mary
  Was there on pleasure bent,
And merely leaned across the rail
  To see where pleasure'd went.

It's quite enough, Roderick, I can stand no more.

See you in September.



Curtiss fired the shells as fast as Hans served them

The Defense of Noronha

by Warren H. Miller

CURTISS dug both hands into the locks of hair back of his ears and pored over the yellow message slips spread out before him. The walls of the new wireless station reflected dimly the shaded incandescents on the sending and receiving desk, and no sound save the licking of the tropical surf on the coral reefs outside broke in on the after-midnight silence.

Curtiss was sorely perplexed. The wireless station of Noronha had been established for strategic and military reasons upon a lonely coral island two hundred miles east of the coast of Brazil. It was the nearest point of dry land to the European cable connections in the Cape Verde Islands, reaching in one relay the important naval bases of Gibraltar, Marseilles and the German concessions in Morocco. There had been much international jealousy, from a military point of view, regarding the control of the station. The soil belonged to Brazil; the dominant influence of France and Germany in both Brazil and Argentina had dictated that a French officer of the line should be in charge; the apparatus had been installed and the station constructed by an American company with Curtiss representing them as the construction engineer.

Then suddenly the whole world had become involved in the Great War. The fundamental aversion of the United States to militarism had caused our country to withhold its sympathy from all that the Prussian military caste represented, and this in turn had been deeply resented. We had seen all we wanted to of the pomp and glory of war in '61; to us all this seemed antiquated, out of date, childish; we could not be induced to approve. Our absorption of a flourishing South American trade that once had been a fond dream of the ruling caste in Germany, stirred this resentment into activity. It showed itself not in overt hostility to the United States, but in the fomenting under Prussian auspices of distrust and hatred of us by the very nations in South America which, under the Monroe Doctrine we were bound to protect. Aided by the 2,000,000 German colonists in those countries, Brazil and Argentina had been goaded into open hostility to us. We little realized how powerful those two nations had grown, how little they respected or feared us, how strong were the commercial and social bonds that knitted them to Germany. And now we were upon the brink of a breach of the Monroe Doctrine, not from without but from within, by the very nations it was designed to protect; and Cur-

tiss on Noronha found himself in the vortex of diplomatic activities. In the event of war, what should he do? Hold the station as a strategic advantage for his own country; turn it over to Lieutenant LaPlanche, the Frenchman, as neutral territory, or destroy it and make his escape to one of our cruisers? The Frenchman and he had become great friends, and he felt that, as La Planche was intensely jealous of everything that represented German influence, he could count on him not to interfere in case he decided to hold the station. Then there was Hans, his German-American electrician; which side he would fight on was yet to be seen, for he had always been intensely sympathetic with the Fatherland's increasing influence in Brazil and any prowling torpedo boat on the Brazilian side was pretty sure to be officered by some of his own countrymen, young university graduates, freiwilligers in the army and navy of the Fatherland, who were making their careers in this new land under the German sphere of influence.

LaPlanche and Hans were the only inhabitants of the island with him at present, all the workmen having been taken off by the last steamer that had touched there. Curtiss studied the situation without arriving at a satisfactory solution. Affairs had reached a serious situation, more serious than the authorities at Washington probably realized, and he well knew that the blow when struck would be sudden, and it would be left to him to do all the deciding on the spot.

Suddenly the receiving galvanometer began to swing. It was of the new electrolytic responder type, taking forty words a minute, and Curtiss translated rapidly, his eyes dilating as he grasped the full import of the words. Then the sending ceased and after a short pause he acknowledged receipt, grabbed up the despatch and dashed into the sleeping quarters of the station.

"LaPlanche! LaPlanche! Wake up!" whispered Curtiss, quivering with excitement, as he shook the khaki-clad figure on the cot before him.

LaPlanche only groaned in the inflexionless cry of the dead-asleep, and his long drooping French eyelashes shuddered as Curtiss bored into his ribs with his knuckles.

"Frogs! Wake up! War's declared!" he hissed into his very ear.

"Nom du nom!" growled the sleeper, turning over and opening half-conscious eyes. *"Dites donc——"*

"It's come! Read this!" cried Curtiss hoarsely, waving the yellow slip. "Get up——"

Into LaPlanche's eyes shot the rapier-like glint that Curtiss had come to love so well. *"Tiens!* We're in the World's War at last!" he exclaimed, now wide-awake and all interest. "America?"

"Yes, us! The best military secret that was ever kept! It's hit us like a steam engine. They're after us—over the heads of these two tropical republics, with the whole continent of South America as the prize! The waking half of the world's agog over it now and the other half will read it at their breakfast tables to-morrow——"

"You! America! Incredible. Why, you are the children of us all—*C'est* impossible!"

"What do you suppose that bunch of Prussian fire-eaters cares about that!" retorted Curtiss bitterly. "They'd drench the world in blood—anything to keep their seats on the back of Germany! If they lose at home, here's where they start in next, and if I know my nation it means open war right off!"

"Eh bien!" snapped LaPlanche excitedly. "And that's your message, is it?"

"You bet! We *are* the war just now, this little lonely island of Noronha, two hundred miles from nowhere off the coast of Brazil, and this wireless station that we Americans put in, and you, Froggy, are to command. Brazil and Argentina have allied against us and declared war."

"Tha's all ri'. And now let's get back to bed. I thought you Americans were noted for sang froid," taunted LaPlanche, slightly arching his eyebrows. "It will be many a day of weary watching over our rim of horizon before we see a hostile ship."

"No. To-night. In twenty minutes.

And we only have the one-pounder out in front of the station.'

"Ah! *Mon Dieu!*" bantered LaPlanche sarcastically.

For answer Curtiss spread out some crumpled message blanks. "I caught these at five o'clock yesterday, just before dawn," he said, quietly, "but thought it best to keep quiet about 'em. Hans, the electrician, you know——"

LaPlanche translated the messages: "Daily coal report in tons—Para, 2,350; Rio Janeiro, 2,295; Argentina, 3,956; Amazona, 3,050," he read.

"All dreadnoughts of the latest type as their names show and since we got them, somewhere within six hundred miles of us, as that is our night limit."

"Ah! Ah! Their fleet coal reports."

"Yes. Signalled as usual to their flagship at eight bells. And, as I caught them at 5 A. M., that places those ships somewhere about the Cape Verde Islands, that is, twenty-four hours ago. I tell you it's the suddenest blow that ever was struck, and we are the blow."

"*Tiens!* and they must still be four hundred miles off! Let's go to bed."

"Wait." Curtiss detained him. "Read this despatch," thrusting the yellow slip before his eyes.

LaPlanche read it over good naturedly. "It's from your consul at Rio, and simply says that reports have reached him that the torpedo boat *Scorpio* left Guyaquil at 10 P. M. last night, diplomatic crisis reached at Washington, war likely declared any hour.' "

" 'Diplomatic crisis at Washington!' " echoed Curtiss savagely. "The *Scorpio* will be here at 3.30. First blow—that's the way wars begin—and it's three in the morning now."

"*Oh! La la!*" derided LaPlanche. "Shall we uncrate the shells?"

"Sure thing, and right now."

"*Mais non!* If she comes to seize the station, all you have to do is to destroy the wireless and surrender yourself. You're still officially in charge here, so I shall not interfere."

"She's coming, don't you worry about that, and what for? Our New Hampshire is now at Pernambuco, and the Washington at Bahia, one battleship, one armored cruiser, widely separated. Do you recall the Varjag incident at the beginning of the Russian war, when a fleet of Japs caught her alone with one gunboat?"

"Oh——?"

"Yes. You and I and those on that torpedo boat are the only persons in this part of the world that know of the whereabouts of that big fleet off the Cape Verdes. I'll bet it's that same fleet which left Buenos Aires a week ago, ostensibly for a practice cruise. What that torpedo boat is after is to sieze this station, pick up their fleet and give them the whereabouts of our cruisers."

"Still, if she comes, all you have to do is to warn your ships, destroy your apparatus and surrender."

"I have warned them, much good it did! Ever hear of any of our ships running away on a wireless rumor and without specific orders from Washington? I tell you they won't move until they actually hear the torpedo-boat calling her own ships—then they will move all right, but it will be too late. They *must* have twelve hours' head start. If we could only fix the wireless so that the torpedo-boat would warn our fleet without reaching theirs——"

"Impossible!"

Curtiss looked at him fixedly, turning a thought over and over in his mind. His eyelids rose until the blue eyes shone through mere slits. "There is a way—" he mused, "but we must fight for it. Will you?"

"*Ah, bon!* Anything better than to rot here day by day, and *Ciel!*—grow fat," yawned LaPlanche, stretching himself. "*Pst!* What was that?" he cried, suddenly straightening up and pointing through the open door of the station out over the sea.

"Where?" exclaimed Curtiss, following the other's index finger.

"Oh, nothing but a wisp of red flame out there in the blackness; there it is again."

"It's her! That's forced draft!" shouted Curtiss, grabbing up a hatchet. "Go wake Hans, while I run down and unpack the shells. He's either got to fight or we'll lock him up somewhere."

Curtiss lit the cellar lamp, pried gingerly at the cover of the ammunition

crate, and had started the first plank when a heavy footstep descended the stairway and Hans stood before him. He had nothing on but his washed out, light-blue overalls. The bare muscles of his huge shoulders stood out in great, knobby bunches in the lights and shadows of the lamp, his general appearance giving a hint regarding his queer character. Possessed of a university education and the thorough, analytic German mind, he had nevertheless, perforce, come to America and obtained employment as a wireless electrician—at double the pay he could earn in the Fatherland as an electrical engineer.

He stood silent, waiting for Curtiss to speak; his face, with its Saxon blue eyes, its blond mustache, its wistful expression, never more in earnest than now.

"Hans," began Curtiss, looking up from the crate, "We are going to be two against the twenty on that torpedo-boat out yonder, and some of her officers and men happen to be your own countrymen fighting for Brazil much as you would do for America."

Hans nodded and shifted his weight to his other foot, concentrating his intelligent gaze on Curtiss' eyes.

"Now what you care to do I leave entirely to your own sympathies, Hans, and to your conscience. We sorely need another man, indeed we do—but I wouldn't ask any man to—to—you know. . . . Suit yourself; with us or neutral, this station's going to be *held*. What do you say?"

Hans made a deprecatory movement and again shifted his weight. "Mr. Curtiss," said he slowly, "I love the Fatherland; what man wouldn't? I know for why she encourage this war. Maybe she right . . . But America! Ah, America!" he exclaimed tenderly, the tears welling up in his eyes. "Mr. Curtiss, she take me cold, an' sick, an' hungry, she gif me vork, she gif me mooney, so I send for mein frau an' mein liddle ones. Mr. Curtiss, I—I—I die for her, gladly. Efry Cherman in America feel that way. It iss our debt."

Curtiss wrung his hand. "That's fine, old man," he muttered huskily. "Maybe the Fatherland is right; but America, right or wrong, for us. Bring up a dozen of these shells, old top, will you, while I go get the canvas off the one-pounder."

He hastened out into the little green in front of the station, where the new one-pounder, with its naval base bedded in a neat concrete pier, pointed seaward. The torpedo-boat was quite near now and coming on fast. Not a light was to be seen on her, only the hum of her draught and an occasional lick of flame out of her funnels told of her approach. Presently she slowed up and stopped while Curtiss shoved in a shell and trained the gun on the dark mass.

"The moon will be up in half an hour. Oh, if I could only see!" he exclaimed anxiously.

"You will not fire now!" exclaimed LaPlanche, on tiptoe at his elbow.

"Sure! Attack's the best defence. Any boat that comes up to this station with no side lights, no signals, ignoring all the laws of navigation, is hostile and ought to be fired on."

"Alloo!" A hail in German came in from the black bulk out over the water.

"Answer him, Hans."

There were a few shouts of parley. "He say you mus' surrender the station," translated Hans, "an' he goes to put overboard a liddle boad."

"Tell him to get under way at once and show his side-lights, or I will fire," commanded Curtiss.

Considerable shouting between ship and shore followed. "He say it is nonsense, and he call me a traitor," said Hans, his eyes flashing angrily.

"Well, there go his davits, and I'm going to open up the minute the boat comes around her stern. If I could only see!"

The three strained their eyes in silence as the noises of lowering and manning a boat reached them. The faint dawn, presaging the rising of the moon, slowly began to relieve the intense blackness of the sea.

"C'est ca!" hissed LaPlance tensely, gripping Curtiss' arm. A blurred black shape separated itself from the larger bulk.

Bang!

"Too high. Missed him. Give me another shell," snapped Curtiss. Hans silently handed up another one.

"My friend, don't bother with the little boat, fire on him, he can't return your fire without wrecking the station," whispered LaPlanche.

"Froggy, old man, I love you for that thought. Here's for his boilers. Quick now! Fast as you can hand 'em to me!"

Curtiss got off the shells as quickly as he could aim, landing one of them. The commander of the torpedo boat was equally swift to comprehend his predicament, however, and, taking the bow-line of his gig, he rang for full speed and circled the point so as to be able to fire across the station at the one-pounder.

"Quick! Bring me some armor-piercers!" shouted Curtiss, firing his shells as fast as Hans could serve them.

LaPlanche dashed below, while the torpedo-boat stopped and took on the gig's crew.

"Now she's got us! Hurry, Frogs! She'll sweep this point in a minute."

A loud report echoed up from the bay, simultaneously with the deafening crash of the shell as it exploded directly in front of them. It was ear-splitting, terrifying, seeming to shake earth and air with its intense dynamic power.

"Now's the time to be economical of our army," said Curtiss jocularly, abandoning the gun and pushing Hans before him. "Here, LaPlanche, come back, come back,—you're too late!"

Again came a belch of fire and smoke from the torpedo-boat and again the driving crash of the shell. It seemed to transport LaPlanche into fury of excitement. He whirled open the breech, jammed in a shell and put his shoulder to the stock, driving home shot after shot as fast as he could crowd in the shells.

Boom! Crash! Another shell exploded over the gun, and there was a tang of steel as one of the guys of the tall aerial mast of the station parted.

"They won't try that again," panted Curtiss; "no more shells for us, LaPlanche! Frogs! He's down; come on Hans."

They dashed out and dragged the Frenchman back into the station.

"It is nothing," he expostulated, struggling to his feet. "A touch. A scratch. *Rien*. The force of it knocked me down."

They tied his left arm in a sling, while the torpedo-boat fired slowly and steadily with both her fourteen-pounders, using solid shot which drummed past and out to sea across the point. The huge red rim of the moon rose over the horizon, bringing ship and shore out, black-red and sharp. Presently a solid shot struck the steel naval base of the gun, wrecking it.

"Now she'll get out a boat," declared Curtiss. "All hands down to the grove of trees along the shore back of the point. Where's Hans? Oh, Hans!" he called, stopping for an instant in the station to pick up his rifle. LaPlanche was already off, brandishing a French automatic pistol in his free hand, so Curtiss waited no longer but ran after him into the dark jungle of ironwood and seaside scrub palms which bordered the mangrove swamp along the shore. Already the gig was pulling across the little bay.

"Now! The quicker the better!" he gasped, taking a rifle rest against a small palm.

"Ah! The *sans culottes*. After you, *mon cher*."

Their shots rang out simultaneously, striking the water beyond the gig; whereupon a sharp command caused her to instantly dash forward, the six oars rising and falling like machinery. A seaman in the bow and two in the stern returned their fire as she came on, while Curtiss looked anxiously over his shoulder for signs of Hans.

"We're lost if we don't sink her. Where, oh where is that thick Dutchman?" growled Curtiss, jamming another magazine clip into place.

The gig tossed oars about fifty feet off the mangroves and headed into the only landing place among them as the rowers snatched up their rifles. Suddenly a huge blurry form trod out into the mangroves and stood motionless in the moonlight for an instant while those in the gig levelled their rifles at him. It was Hans. In another second

a thin sizzling arc of fire curved out from him to the boat, while the rifles aimed at him spit out their steel bullets. Then came a dazzling glare, a stunning report, a chorus of hoarse shrieks, and the water was dotted with bobbing heads amidst a few floating splinters and frames of the gig.

"Arnold von Winkelried over again!" exclaimed Curtiss pityingly, straining his eyes on the still form of the devoted Hans lying under the mangroves. "Isn't that the Teuton of it, though, to give one's self for all! He must have fixed over one of our shells into a kind of bomb. Poor Hans! Come on Frogs!" he called to LaPlanche in the jungle. "They got him, but they paid dearly for it, ten to one, I'll bet. Leave off potting those poor devils in the water; there's two of them can't swim a stroke as it is. Let's get back to the station."

"*Regardez;* the other boat," answered LaPlanche, pointing towards the torpedo boat.

"All the better. We have a few minutes to think up something new, as they will wait for her to come up."

LaPlanche shrugged his shoulders. "*Eh bien!* There is still a good harvest of herrings below. But I'm all out of shells anyhow," he said philosophically.

"Well, France and Germany have had a crack at it; now let's see what a Yankee can do," said Curtiss as they reached the station grass-plot. "Why, here, this thing's no bigger than one of those ancient petronels," he cried, kicking the dismounted one-pounder; "give me a shrapnel shell and some help around with it to the other side of the station and I'll show you what a Yankee can do!"

"My friend, she will kick your shoulder-blade down into your lungs without the steel pedestal mount."

"Never mind, Hans knew how to die. I guess I can stand a little mule-play. Help me carry the thing, old man. It's our only chance."

They unbolted the swivel-pin and carried the gun around to the other side of the station, where it would command the grove of trees along the shore. Hurriedly they buried the piece in a low mound of cement bags and sand, while the noises of the landing of the second boat floated up to their ears.

"Now, get down, Frogs," said Curtiss, slipping in the shrapnel, "we're to be heard, not seen, you know. That lieutenant's going to march his men abreast through that jungle, and when they come out into the open—"

"*Eh bien?* You will be Chanticleer."

"Raise the sun, eh?"

"You will raise the devil, *mon cher,*" corrected LaPlanche cheerfully.

"If we can only hold them till the sun does come up."

"Ah—? You have a plan?"

"Why, don't you know—that's all we're after! We've just got to hold 'em till the sun comes up."

"But, *mon ami*—Pst! Here come the herrings!" The squad from the torpedo-boat burst through the trees and formed in the open. Another sharp command and they started to march across the little field.

"It's like taking money from a blind organ grinder," drawled Curtiss, bracing his shoulder against the firing stock and shutting both eyes.

Boom!

The shrapnel opened out with a sound of many rapiers swishing the air, mingling with the cries of wounded men, the scattering volley of the platoon and the guttural shouts of their lieutenant, who angrily waved the survivors back into the jungle, disappearing immediately himself.

"*Encore!*" jeered LaPlanche, stopping the sputtering fusillade of his own weapon. "Those that do die of your goose-gun, my friend, seldom or never recover. Six down if I reckon right."

"I don't believe they're feeling very well just now," gulped Curtiss, trying to smile; despite his efforts, however, the twitching of the muscles of his mouth increased.

"Hurt?"

"Yes—shoulder—help me to—station—old scout, will you——?" He fell over on his side, almost unconscious with the pain.

LaPlanche felt for the wound, locating a smashed collar bone, and then resignedly rolled a cigarette, paying no

attention to the pattering fire from the thicket.

"Dawn's come, and this moonlight's half daylight already," he observed. "If I pick up the American and try to hobble with him to the station, with all those rifles in the bushes"—he shrugged his shoulders—"the defense of Noronha will come to an end *toute de suite*."

"Frogs—drag me—straight back—from this mound—keep down out of sight——"

"Inhuman! Drag you! Man, your shoulder-blade's cracked."

"Do it, I say——!" Again he fell over and buried his face in his arm.

LaPlanche shrugged his shoulders and slowly began to work the grim, silent body towards the station, while the zipping chorus of bullets whistled over their heads. Soon a shout from the thicket and a bullet which clipped Curtiss' head told them they were discovered, and LaPlanche, picking up his man, dashed around the corner of the building and in at the rear door, which he slammed and barred.

"*Mais non!* but soon!" he gasped, as Curtiss staggered into a chair. The desultory fire outside kept on, but Curtiss hardly heard it. His wandering gaze had fixed itself on the metallic collar at the extreme top of the aerial mast, which could just be distinguished through the upper panes of the station windows. He watched the shiny metal fascinated, curious, incredulous of his own eyesight, as the minutes slipped by, for it appeared to glow and shine with a peculiar radiance.

"My friend," declared LePlanche solemnly, returning from an observation at the windows, "this defense is almost *a fin*. They've brought up a cannon from the ship and it's on the edge of the woods now. What are you starting up at?"

"Top of mast. Look! Sun! Never mind gun," gasped Curtiss, "they daren't fire it. Look—top—wireless—mast——"

"Ah! Ah! Sunlight! The Sun!"

"Thought so—that' s all—let 'em come."

"First this though, eh?" questioned LaPlanche, aiming his pistol at the big wireless induction coil.

"No! Let it alone!"

—"*Nom du nom!* Let it alone? What? Don't you want to save your ships?"

"Put up your pistol!"

Crash! The main door was torn from its hinges and driven in upon them by a rain of grape shot, its fall simultaneous with the report of the field piece on the edge of the jungle. There was a sharp shout and the squad of sailors charged across the field, dragging the cannon with them. They whirled it about in front of the door and took position.

"Quick! Wave handkerchief," commanded Curtiss, laying a restraining hand on LaPlanche's pistol, "set me down in doorway."

LaPlanche, wondering, mystified, did as he was bid. They made a ghastly group, framed in the black doorway of the station, Curtiss pallid and helpless in a chair, LaPlanche with his left arm in a loose white sling; both grimy and bloodstained.

"Congratulations, a most desperate defense," saluted the German-Spanish lieutenant, standing beside his cannon with drawn sword. "Where are the rest of your men?"

"Here's all we ever had, except poor Hans," answered LaPlanche for the semi-conscious Curtiss.

"What, two!"

"We did our best. Are those seven all you have left?"

The lieutenant bowed stiffly and motioned to two of his men, who saluted and stepped inside to the sending table.

Presently the crackling signal sparks played at the wireless discharge. LaPlanche began to sob.

"Look, traitor!" he stormed, turning fiercely on Curtiss, "*Voila*—the doom of your ships! Do you know what they have just said? I will tell you: 'War declared. Have captured Noronha station. U. S. S. New Hampshire at Pernambuco, Washington at Bahia. Come quickly. Scorpio. Noronha.' You'll hear the answer soon."

"Let 'em—talk, Froggy—let 'em talk," smiled Curtiss amiably, and again his head fell forward on his arms.

"Ah, bah! You should have de-

stroyed your wireless when you had the chance. Do you know what they are sending now? 'Advise detach Argentina, Para, immediate capture Washington; main fleet attack New Hampshire.' For me, I'd rather be dead than sit here and listen to the answer to that message."

"I—want—to—*laugh*," choked Curtiss, grinning painfully. "There won't be any answer."

"What?" yelled LaPlanche excitedly, while the lieutenant frowned impatiently at the chatter in the hated English tongue.

"No—you and I—know something—about wireless—that this—young lieutenant—don't. They're warning—our ships, Froggy—can't reach their's now—too far off and too late. Sun."

"*Diable!* I see. I'd clean forgot. Wireless carries only a third as far by daylight as at night. And our day range is but two hundred miles! Talk, *mes innocents*," he whispered triumphantly. "Talk! Only the American ships can hear you now! And that's why you held out till sunrise, *mon cher!* Ah, *mon Dieu!*"

THE ICE PATROL SERVICE

The U. S. Coast Guard cutters Seneca and Miami have been detailed to carry on the International Ice Observation and Ice Patrol Service provided for by the International Convention for the Safety of Life at Sea, London, 1913-14.

The object of the Ice Patrol Service is to locate the icebergs and field ice nearest to the trans-Atlantic steamship lane. It will be the duty of patrol vessels to determine the southerly, easterly, and westerly limits of the ice, and to keep in touch with these fields as they move to the southward, in order that radio messages may be sent out daily, giving the whereabouts of the ice, particularly the ice that may be in the immediate vicinity of the regular trans-Atlantic steamer lane.

The Miami on April 16 relieved the Seneca, which had been performing Ice Observation and Ice Patrol Service since February 15, 1915, and during the months of April, May and June, and as much longer as necessary, these two vessels will alternate on patrol, making alternate cruises of about fifteen days in the ice region; the fifteen days to be exclusive of time occupied in going to and from Halifax. The movements of the vessels will be so regulated that on the fifteenth day after reaching the ice region the vessel on patrol will be relieved by the second vessel if possible, at which time the first vessel will proceed to Halifax, replenish her coal supply, and return in time to relieve the other vessel at the end of the latter's fifteen-day cruise.

Having located the ice, the patrol vessel will send daily the following wireless messages in 75th meridian time:

(a) At 6 P. M. (75th meridian time) ice information will be sent broadcast for the benefit of vessels, using 600-meter wave length. This message will be sent three times with an interval of two minutes between each.

(b) At 6.15 P. M. (75th meridian time) the same information will be sent broadcast three times in similar manner, using 300-meter wave length.

(c) At 4 A. M. (75th meridian time) a radiogram will be sent to the Branch Hydrographic Office, New York City, through the nearest land radio stations, defining the ice danger zone, its southern limits, or other definite ice news.

(d) Ice information will be given at any time to any ship with which the patrol vessel can communicate.

Ice information will be given in as plain concise English as practicable, and will state in the following order:

(a) Ice (berg or field).
(b) Date.
(c) Time (75th meridian time).
(d) Latitude.
(e) Longitude.
(f) Other data as may be necessary.

While on this duty, the patrol vessel will endeavor by means of daily radio messages to keep ships at sea advised of the limits of the ice fields.

The Rapid and Simple Calculation of the Inductance of a Cylindrical Single Layered Coil

Especially prepared for amateur experimenters

By William A. Priess, B.Sc., R.E.

A STIFF wire when struck vibrates with a certain constant frequency. The period of its vibration is determined by the elasticity of the wire and the distribution of its mass. If an electrical system is correspondingly disturbed it likewise vibrates with a certain definite frequency. In this case the period is determined by the inductance and the capacity of the circuit. Since radio-telegraphic work is joined to an overwhelming extent with the problems concerning the electrical period of a circuit, it is essential that we find some means of calculating the governing factors.

The frequency of oscillation for an electrical circuit was given by Thomson in 1853 as approximately

$$\frac{1}{2\pi\sqrt{LC}} = n, \quad \ldots\ldots\ldots \quad (1)$$

where n is the frequency per second, L is the inductance of the circuit and C its capacity. Naturally L and C must be measured in the same electrical units. The practical unit for capacity is the farad. The practical unit for inductance is the henry or 10^9 centimeters.

Both quantities may be distributed as in the case of an antenna, or concentrated as in the case of coils and condensers. We shall limit ourselves in this discussion to the latter form in which these constants appear.

The Capacity of a Condenser

The calculation for the capacity of the usual forms of condensers is a simple matter. A condenser generally consists of two plane or cylindrical conducting surfaces separated by a dielectric of constant thickness. The problem requires knowledge of the dielectric constant of the insulator between the plates (this quantity being unity for a gas and greater for other mediums; its value is found in the tables of any electrical handbook) and the area and thickness of the dielectric under strain.

The capacity of a condenser formed by two plates each of area, A, separated a distance, D, by an insulator whose dielectric constant is K, is

$$C = \frac{K A}{36\pi D}\, 10^{-11} \text{ farads} \quad \ldots\ldots \quad (2)$$

For example: The capacity of a condenser formed by two plates 30 cms. square, and separated by a sheet of flint glass 0.2 cms. thick is found as follows:

$K = 10$ (from electrical handbook)

$A = 900$ cms.

$D = 0.2$ cms.

$$C = \frac{10 \times 900}{36\pi \times 0.2} \times 10^{-11} \text{ farads}$$

$$= \text{antilog. } [\log. 10 + \log. 900 - \log. 36 - \log. \pi - \log. 0.2] \times 10^{-11} \text{ farads.}$$

$$\begin{array}{rl} \log.\ 10 = & 1.0000 \\ \log.\ 900 = & 2.9542 \\ \hline & 3.9542 = (a) \end{array}$$

$$\begin{aligned} \log.\ 36 &= 1.5563 \\ \log.\ \pi &= 0.4970 \\ \log.\ 0.2 &= -1.3010 \\ \hline & 1.3543 = (b) \\ & 3.9542 \\ & 1.3543 \\ \hline (a - b) &= 2.5999 \\ \text{antilog. } [\ ] &= 398 \end{aligned}$$

$C = 3.98 \times 10^{-9}$ farads $= 0.00398$ microfarad.

In the case of cylindrical condensers the only added difficulty is the calculation of the area of the active cylindrical surface presented.

The Inductance of a Coil

The most easily constructed and by far the most useful type of inductance in radiotelegraphic work is a cylindrical single layered coil of wire. We shall, therefore, confine our remarks to this form entirely. This calculation is somewhat more complicated than that of the capacity of a condenser and formulæ expressing its value usually contain a long series of diminishing terms of the increasing powers of the geometrical dimensions of the coil. For example: Webster gives for the inductance of a cylindrical coil of length *b*, radius *a*, containing *n* total turns, the following expression:

$$L = 4\pi^2 \frac{a^2 n^2}{b} \left\{ 1 - \frac{8a}{3\pi b} + \frac{a^2}{2b^2} - \frac{a^4}{4b^4} + \frac{5a^6}{16b^6} - \frac{35a^8}{64b^8} + \frac{147a^{10}}{128b^{10}} - \dots \right\}$$

$\times\ 10^{-9}$ henries .... (3)

Obviously this is a most tedious calculation. Nagaoka simplified this equation by calling the quantity under the parenthesis a certain constant K, which he evaluates with regard to the parameter $\frac{\text{diameter}}{\text{length}} = \frac{2a}{b}$:

The equation then reads:

$$L = 4\pi^2 \frac{a^2 n^2}{b} K_1 \times 10^{-9} \text{ henries } * \dots (4)$$

* Since there are 10^9 cms. of inductance in a henry

The tables of $K. - \frac{2a}{b}$ may be found in B. of S., Vol. 8, No. 1, pp. 224-225. We have plotted K for all coils lying between a coil of infinite length and a coil whose diameter is 9½ times its length. The curves therefore cover practically all the combinations of length and radius used in practice. The value of K is seen to lie between unity for the slimmest of coils and 0.21 for the broadest of coils under consideration.

To calculate the inductance of a coil

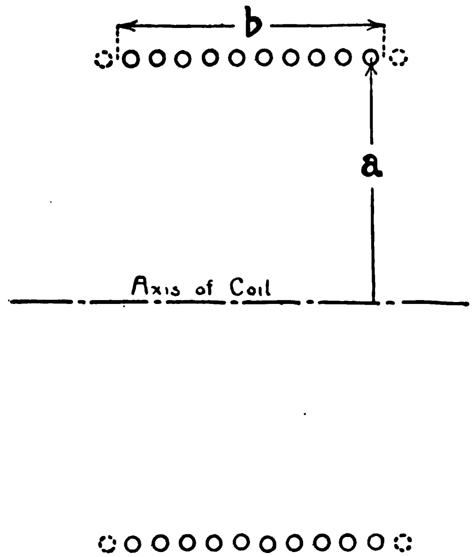


FIG. I

of length b, radius a, containing n total turns of wire, we pick the value of the

$$L = 4\pi^2 \frac{a^2 n^2}{b} K. \text{ cms. of inductance.}$$

abscissa, K, corresponding to the ordinate $\frac{2a}{b}$ from the curves and substitute it in equation (4).

In radio design we encounter two types of inductance coils. First the coils used in the oscillatory circuits of the transmitter, which are constructed of heavy wire to carry efficiently the large currents employed. The turns on this type of coil are widely separated to pre-

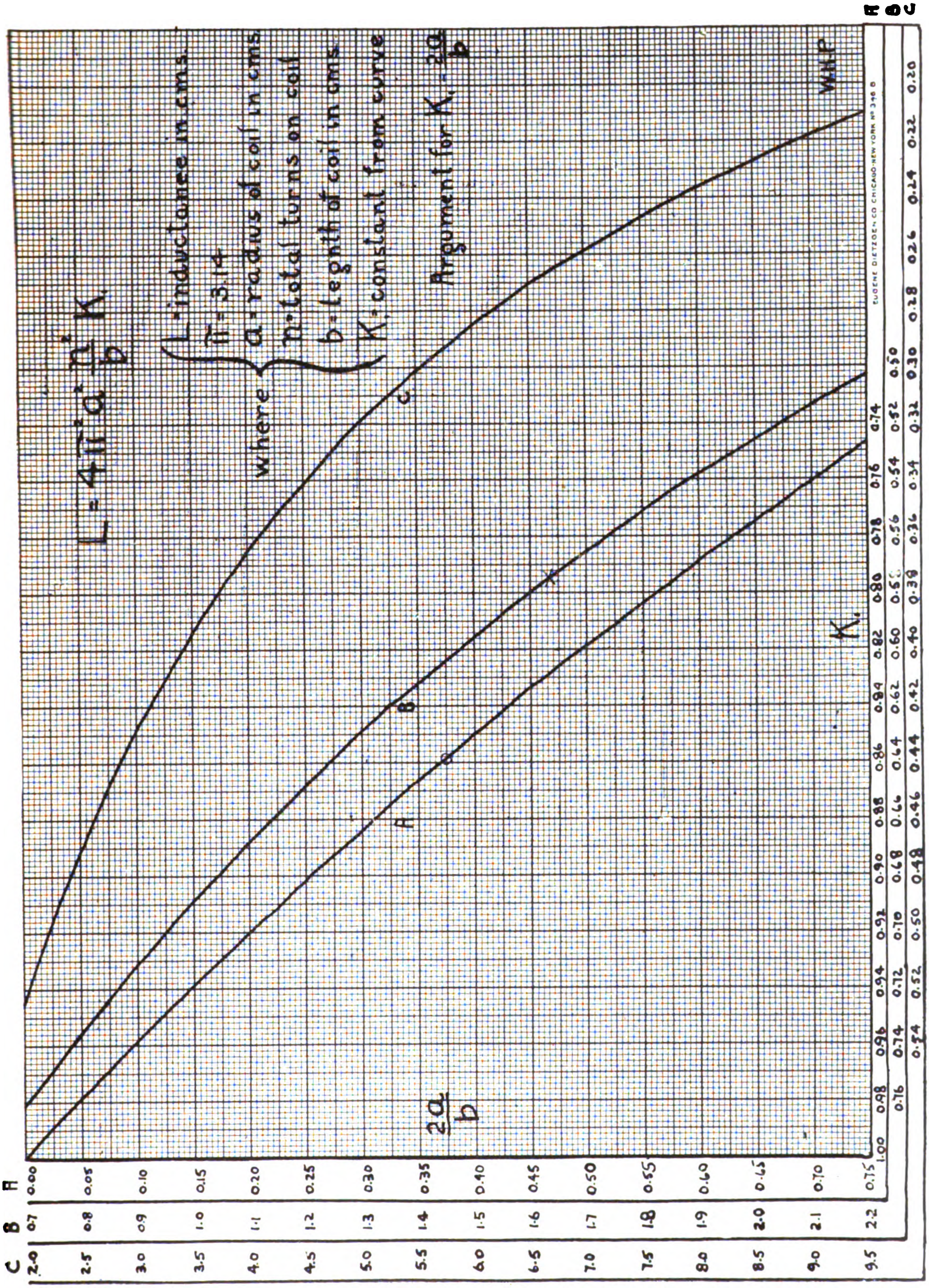

$L = 4\pi^2 a^2 \frac{n^2}{b} K_1$
where
L = inductance in cms.
π = 3.14
a = radius of coil in cms.
n = total turns on coil
b = length of coil in cms.
K, = constant from curve
Argument for K, = 2a/b
W.H.P.
K,
2a/b
A
B
C

Fig. 3

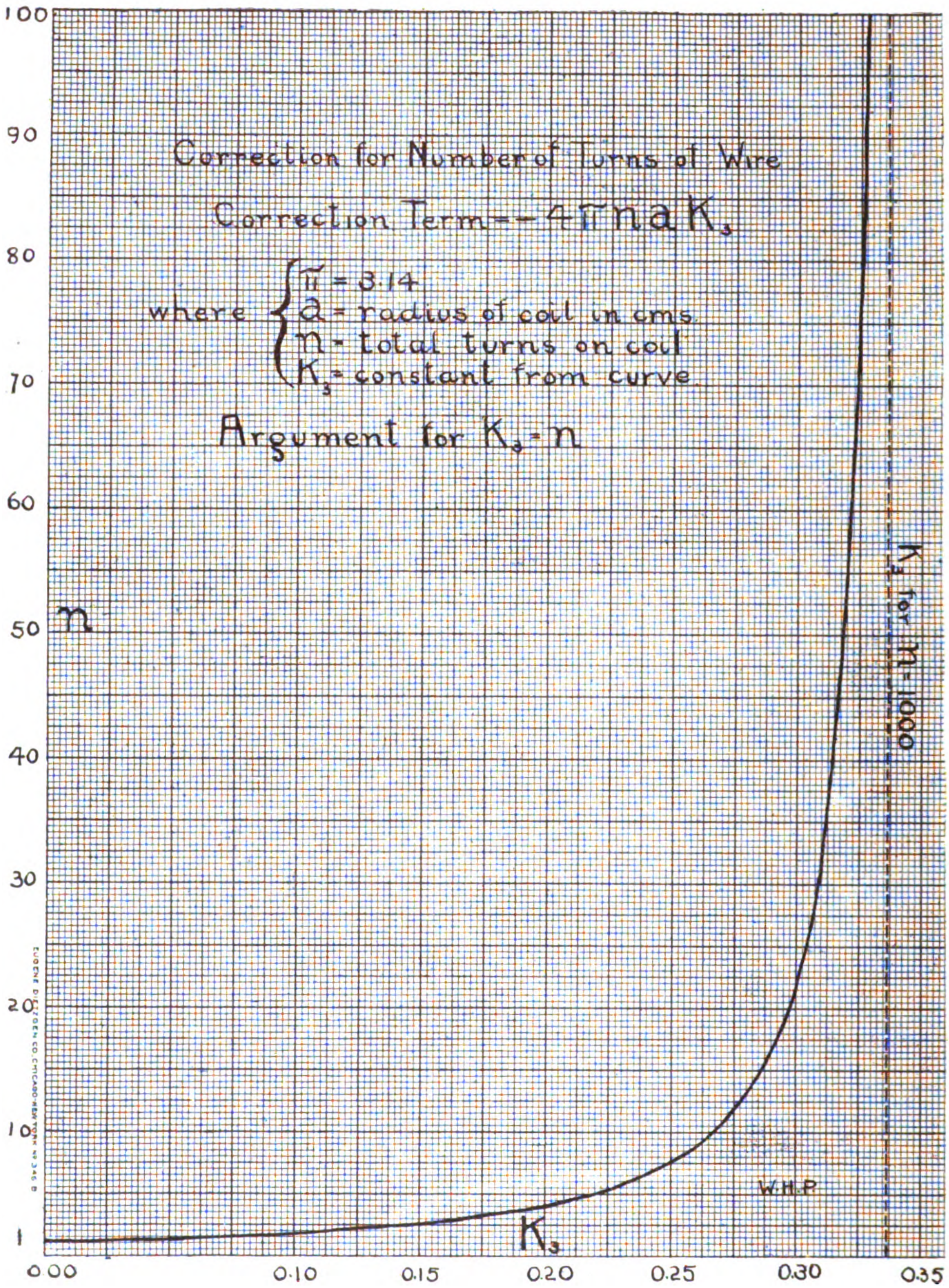


Fig. 3

vent sparking between them, due to the high voltages generated by the rapid oscillation of the enormous instantaneous current flowing. Therefore in order to obtain the proper value of inductance for resonance, these coils must necessarily be of a bulky design. Second, the form of coil used in the receiver. Here we deal with minute currents and voltages and can therefore use light compact coils to obtain the required inductance for resonance. We shall calculate the inductance of a coil of each type.

Example I

Calculate the inductance of a cylindrical coil having a mean diameter of 18 inches and wound with 10 turns of wire spaced an inch apart.

Referring to Fig. 1, we see that the length, *b*, is the overall length of the winding, including the insulation, which *a* is the mean radius.

$$n = 10$$
$$b = 11 \text{ inches} = 27.9 \text{ cms.}$$
$$a = 9 \text{ inches} = 22.9 \text{ cms.}$$
$$\frac{2a}{b} = \frac{18}{11} = 1.635$$

The ordinate corresponding to 1.635 on the Nagaoka $\frac{2a}{b}$ K. curve is found in the second or B column. This ordinate intersects the B curve at the cross corresponding to the value K. = 0.575 on the B abscissa. Therefore, substituting these values in equation (4):

$$K. = 0.575$$
$$L = 4\pi^2 \times \frac{(22.9)^2 \times (10)^2}{27.9} \times 0.575$$

$\times 10^{-9}$ henries = antilog. (log. 4 + 2 log. π + 2 log. 22.9 + 2 log. 10 + log. 0.575 — log. 27.9) cms.

log. 4	=	0.60206
2 log. π	=	0.99414
2 log. 22.9	=	2.71978
2 log. 10	=	2.00000
log. 0.575	=	— 1.75967
		6.07565 = (e)
log. 27.9	=	1.44560 = (f)
		6.07565
		1.44560
(e — f)	=	4.63005

antilog. 4.63005 = 4.27×10^4

L = 4.27×10^4 cms. = 4.27×10^{-5} henries.

Example II

Calculate the inductance of a cylindrical coil 3 inches in diameter and 8 inches long, wound closely with No. 26 double silk covered wire.

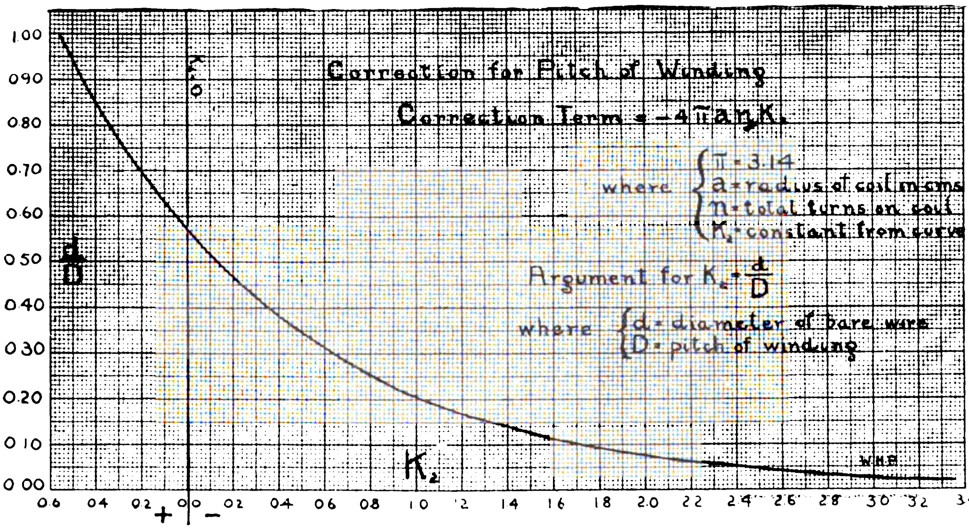


Fig. 4

The diameter of a No. 26 double silk covered wire as found in an electrical handbook is 20.14 mils.

$$n = \frac{8}{0.02014} = 397 \text{ turns}$$
$$b = 8 \text{ inches} = 20.3 \text{ cms.}$$
$$a = 1.5 \text{ inches} = 3.81 \text{ cms.}$$
$$\frac{2a}{b} = \frac{3}{8} = 0.375$$

The ordinate corresponding to 0.375 on the Nagaoka $\frac{2a}{b}$ K. curves is found in the first or A column. This ordinate intersects the A curve at dot circle corresponding to the value $K_1 = 0.859$ on the A abscissa. Therefore:

$$K. = 0.859$$

Substituting these values in equation (4)

$$L = 4\pi^2 \times \frac{(3.81)^2 \times (397)^2}{20.3} \times 0.859$$

$\times 10^{-9}$ henries = antilog. (log. 4 + 2 log. π + 2 log. 3.81 + 2 log. 397 + log. 0.859 — log. 20.3) cms.

log. 4	=	0.60206
2 log. π	=	0.99414
2 log. 3.81	=	1.16184
2 log. 397	=	5.19748
log. 0.859	=	— 1.93399
		7.88951 = (c)
log. 20.3	=	1.30750 = (d)
		7.88951
		1.30750
(c — d)	=	6.58201

antilog. 6.58201 = 3.82×10^6

$L = 3.82 \times 10^6$ cms. $= 3.82 \times 10^{-3}$ henries.

In certain cases we wish to wind a coil of a predetermined value of inductance. For example, we have a bobbbin of length b and diameter 2a, and wish to wind it so that it will have an inductance of value L. The only factor we do not know is the total number of turns that the winding should contain. This can be determined as follows:

$$\text{Since } L = 4\pi^2 \frac{a^2 n^2}{b} K.,$$

transposing we have

$$n = \frac{L\ b}{4\ \pi^2\ a^2\ K.} \quad \ldots\ldots \quad (5)$$

Since there are n turns in the length b, the turns must be wound with a pitch of $\frac{b}{n}$.

Corrections to be Applied When the Coil is Wound With Circular Sectioned Wire

The foregoing applies with extreme accuracy only to the theoretically perfect case of a current sheet. That is to say, a coil wound with infinitely thin tape, the turns of which touch but are assumed not to be in electrical contact. Rosa has considered the practical case of coil wound with circular sectioned non-magnetic wire and has given an expression by means of which the current sheet formula may be applied. If we call the current sheet inductance L_s, and the true inductance L, then

$$L = L_s - L_c \quad \ldots\ldots\ldots\ldots\ldots \quad (6)$$

where L_c is the correction term. This term he finds equal to

$$4\pi a n (K_2 + K_3) = L_c \quad \ldots\ldots \quad (7)$$

where K_2 and K_3 are constants of the coil expressed by him in the B. of S., Vol. 8, No. 1, pages 197-199.

We have plotted K_2 and K_3. K_2 is a correction factor plotted to the parameter $\frac{d}{D}$, or the ratio of the diameter of the bare wire to its pitch. K_3 is a correction factor plotted against the total number of turns n as an argument. Examining the $\frac{d}{D}$ — K_2 curve we see that K_2 may be positive zero, or negative. On the left of the K_2 — 0 line, K_2 is positive, on the right of this line K_2 is negative. The other constant, K_3, is equal to zero for one turn and increases rapidly to a limiting value of $K_3 = 0.3365$ for 1,000 turns.

We shall calculate this correction, L_c, for the two previous cases in which we estimated the current sheet inductance. (Example I.)

Assume the wire to have a diameter of a quarter of an inch. Then

$$\frac{d}{D} = \frac{0.250}{1.000} = 0.250.$$

From the $\frac{d}{D}$ —— K_2 curve we find $K_2 = -0.80$.

Since

$$n = 10,$$

from the n —— K_3 curve we find $K_3 = 0.266$.

From equation (6)

$$\begin{aligned} L &= L_s - L_c \\ &= L_s - 4\pi a n (K_2 + K_3) \\ &= 4.27 \times 10^4 - 4\pi a n (-0.80 + 0.266) \\ &= 4.27 \times 10^4 \times 4\pi \ (22.9\ (10)\ (0.534) \text{ cms.} \end{aligned}$$

$$L_c = -\text{antilog. (log. } 4 + \text{log. } \pi + \text{log. } 22.9 + \text{log. } 10 + \text{log. } 0.534) \text{ cms.}$$

$$\begin{array}{lll}
\text{log. } 4 & = & 0.60206 \\
\text{log. } \pi & = & 0.49707 \\
\text{log. } 22.9 & = & 1.35984 \\
\text{log. } 10 & = & 1.00000 \\
\text{log. } 0.534 & = & 1.72752 \\
\hline
 & & 3.18651
\end{array}$$

antilog. 3.18651 = 1540

$$L_c = -0.154 \times 10^4 \text{ cms.}$$

$$L = 4.27 \times 10^4 + 0.154 \times 10^4 \text{ cms.}$$
$$= 4.42 \times 10^4 \text{ cms.}$$

$$\frac{L_c}{L} = \frac{0.154}{4.42} = 3.5\%$$

(Example II.)

The diameter of a bare No. 26 wire is 17.90 mils. Therefore

$$\frac{d}{D} = \frac{17.90}{20.14} = 0.889$$

From the $\frac{d}{D}$ —— K_2 curve we find $K_2 = + 0.441$.

Since $n = 397$, K_3 = approximately 0.335.

From equation (6) and (7)

$$L = L_s - L_c$$
$$= 3.82 \times 10^6 - 4\,\pi\,(3.81)\,(397)\,(0.441\ 0.335) \text{ cms.}$$

$$L_c = \text{antilog. (log. } 4 + \text{log. } \pi + \text{log. } 3.81 + \text{log. } 397 + \text{log. } 0.776) \text{ cms.}$$

$$\begin{array}{lll}
\text{log. } 4 & = & 0.60206 \\
\text{log. } \pi & = & 0.49707 \\
\text{log. } 3.81 & = & 0.58092 \\
\text{log. } 397 & = & 2.59879 \\
\text{log. } 0.776 & = & 1.89042 \\
\hline
 & & 4.16926
\end{array}$$

antilog. 4.16926 = 14,800

$$L_c = 0.0148 \times 10^6 \text{ cms.}$$

$$L = 3.82 \times 10^6 - 0.0148 \times 10^6 \text{ cms.}$$
$$= 381 \times 10^6 \text{ cms.}$$

$$\frac{L_c}{L} = \frac{0.0148}{3.81} = 0.39\%.$$

The percentage error if this correction is neglected is seen to be rather large for some coils and negligible for others.

Further correction may be made to compensate for the high frequency phenomenon of an altered current distribution in the cross section of the conductor, and consequently an altered inductance. This phenomenon always results in a decrease of inductance over the normal current distribution figure. For an infinite frequency the field within the conductor is neglected. The change of inductance due to frequency is prominent in coils built of wire of large cross section, and negligible in coils wound with very fine wire. However, there is no noticeable change of inductance with frequency for coils wound with "litzendraht," or stranded cable built of separately insulated fine wires, even though the cross section of the cable be very large.

TODD PACIFIC COAST RADIO SUPERINTENDENT

Lieutenant Commander E. H. Todd has been appointed Pacific Coast superintendent of radio service, with headquarters at the naval training station on Yerba Buena Island, according to advices received in San Francisco from the navy department headquarters in Washington.

Todd has been in the navy since 1906, enlisting from Illinois. For two years he has commanded the torpedo flotilla of the Pacific fleet. While official headquarters will be on Yerba Buena Island, he will also have offices in the new custom house in San Francisco.

NEW ORLEANS STATION NEARING COMPLETION

The work of enlarging the naval wireless station at New Orleans and installing more powerful instruments is nearing completion, and the Navy Department has been informed that the plant soon will be ready for operation, according to a dispatch from Washington.

As rebuilt the New Orleans station will be the second largest of those owned by the government. It will have a power of 30 kilowatts against the five of the original plant, and will be used principally as a relay for messages between the Atlantic and Pacific Coast stations.

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G. W. Nicholls......*District Superintendent*

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Fourteen Years in Wireless

As Related by William J. Brooker, a Veteran of the Marconi Service

William J. Brooker, one of the oldest operators in the American Marconi Company in point of service, resigned recently at the age of forty-five. He has written the following story of his experiences, which range from the early days of wireless to the present—a period of fourteen years.

MANY changes have taken place in wireless telegraphy since I entered the service of the Marconi International Marine Communication Company, Limited, in Great Britain, on March 8, 1901. Those were the days of what is now known as the "coherer age." The magnetic detector afterwards replaced the clumsy coherer receiver, and the modern equipment is still further improved.

Ten days after I had entered the Marconi service I reported for duty at the Chelmsford works, where I received a course of instruction preparatory to being sent to Caister-on-Sea to assist in building a station. I remained at the station until the following October, when I was detailed as operator on the steamship Lake Champlain, which was bound for Canada. Then I was transferred to the Campania, which was about to leave Great Britain for America. My instructions were to exchange posts with the more experienced operator on the Umbria when she called at Queenstown and return to Liverpool to rejoin the Lake Champlain. The weather interfered with this plan, however, the wind kicking up such a sea that the Umbria was unable to stop at Queenstown with safety. Thus fortune gave me an opportunity to voyage as wireless man on a first-class trans-Atlantic liner.

The wireless equipment consisted of a ten-inch coil, two receivers, a Morse printer and a call bell, the latter occasionally disturbing the operator's dreams. There was not great prospect of active

William J. Brooker, photographed in uniform on board ship

communication, for there were only three other steamships on the North Atlantic that we were likely to wireless—the Lucania, Umbria and Etruria. On the European side the land stations were Holyhead, Rosslare and Crookhaven

The station on the American side was the Nantucket Lightship.

I picked up Crookhaven without trouble and worked with that station while we traversed about fifty miles. Then came an exchange of marconigrams with the Lucania. When I picked up the Nantucket Lightship I was called upon to transmit a number of messages, all of which were satisfactorily handled. So when we reached New York I was not dissatisfied with my record as an operator.

My next voyage was even more successful from the viewpoint of the wireless man than the first and as a result I received an increase in salary. After a while I was transferred to other ships, among them being the Lucania and Inomia.

Entering the service of the American Marconi Company in August, 1912, I was assigned to the steamship New York. One of the most vivid recollections I have of my wireless experience is connected with the wreck of this vessel. The New York was steaming across the Channel toward Southampton in a dense fog, when she came in collision with the British transport Assay. We were damaged considerably, the ship arriving at Southampton with a large hole in her bottom and a quantity of water aboard.

I was then transferred to the St. Louis, on which I completed six voyages. One day, however, her cylinders burst and she was forced to lay up for five months. After the repairs had been made I rejoined the vessel, acting as operator aboard her for more than five years. Another transfer found me aboard the Philadelphia, but in January, 1911, I again joined the New York, on which I made two cruises, one to the West Indies and the other to Central and South America.

My detail on the New York was marked by two occurrences which well illustrate the perils of the sea. During a storm in November, 1913, a heavy sea caused the vessel to keel over beyond the safety limit, displacing the motor generator in the wireless room and smashing the tank of condensers. The gale accomplished general destruction in various parts of the ship and few of us were without anxiety while it blew.

The New York met with a second mishap while she was crawling through a thick fog early in the morning of June 13, 1914. We were about 800 miles from Nantucket when we heard the whistle of a steamship. Our vessel was instantly stopped and the engines were reversed to full speed astern, but the ominous whistling become more distinct. Then the approaching vessel was seen through the mist, headed directly for us. She struck us about fifty feet from the bow, making a large wound, although the damage did not extend below the water line. The weather was so thick at the time that even the name of the vessel with which we came into collision could not be seen. It was ascertained by wireless, however, after the two ships had separated.

This brings to a close my brief review of the time I spent in the Marconi service. The foregoing contains only a few of the incidents which went to make up my life during the time I spent as a wireless man on ship and shore. I have not mentioned the many happenings of an unimportant but pleasant nature which help to cheer the dull hours an operator sometimes finds himself facing, nor the agreeable people with whom I came in contact. They all go to make up pleasant recollections of an eventful and not unprofitable fourteen years.

Hudson Strait Station Planned

During a debate on navigation in Hudson Bay, held recently in the Canadian House of Commons J. D. Hazen, minister of marine, announced that the first wireless station would be placed on Hudson Strait. This station will be able to work with the stations at Port Nelson and Le Bas. Mr. Hazen said in answer to a question, that more than one station would be necessary on the Strait in order that ice conditions might be known. Twelve beacons have already been erected in the Strait.

Russia has decided to build a wireless station at Nicolaieff in the Odessa district in order to receive time signals from the Eiffel Tower.

Marconi Men

The Gossip of the Divisions

Eastern Division

P. G. Eberle has succeeded Earl Thornton on the Crofton Hall.

W. E. Bisgrove has been assigned to the E. L. Doheny, relieving G. H. Thomas, formerly of the English Marconi Company's service, who has been detailed as senior on the Korona.

R. E. Pettit has been assigned to the Charlton Hall, a one-man ship.

W. S. Scott has been reassigned to the St. Paul.

J. P. Callan is now junior on the Antilles.

L. J. Michael and C. S. Gould have been assigned to the Coamo as senior and junior, respectively, relieving J. R. Churchill and A. E. Ericson, who are on sick leave.

I. Ellingham, third trick operator at Sea Gate, has resigned from the service. His place has been filled by J. L. Lynch, formerly of the trans-Atlantic staff.

V. H. Rand has been transferred to the Honolulan of the Pacific Coast Division.

R. D. Magann is now junior on the Momus. C. C. Langevin has been detailed to succeed him on the Lampasas.

W. H. Boyle has been detailed to the steam yacht Wakiva, which recently went into commission.

J. R. Churchill and S. R. Kay have been assigned to the Zulia as first and second, respectively.

H. McDonald is now in the New Orleans Division. He has been assigned to the C. A. Canfield.

J. R. Joiner has been transferred to the Alabama. J. S. Farquharson, a new man, has been assigned to take his place as junior on the Florizel.

A. I. Yuter is on the Pleiades.

Sam Schneider is now on the Havana as senior.

F. Lumea has been promoted and is now senior on the Northland.

F. W. Rosenquit is attached to the Comet.

E. H. Bootes has been detailed to the Philadelphia of the Red D Line replacing P. W. Harrison, who has been transferred to the Concho.

J. Maresca is now junior on the Arapahoe.

C. Sandbach and L. C. Callan have replaced G. P. Hamilton and H. M. Ash on the Guiana. Hamilton and Ash are now on the Monterey as senior and junior. Callan is a Baltimore man.

W. H. Wood is now attached to the Florizel as senior. T. A. Tierney, formerly first on that vessel, is now on the Comal.

P. J. Barkley has succeeded H. Williams on the Stephano. Williams is no longer in the service.

J. M. Bassett is now on the North Star as senior. A. E. Voightlander has resigned.

J. W. Swanson has resigned. L. C. Driver has been assigned to succeed him as senior on the Saratoga.

R. A. Merry is now senior on the Apache.

C. Preiss of the Jefferson accidentally shot himself in the hand while celebrating on the Fourth of July. He was relieved on the Jefferson by F. Mayer. The wound, however, proved to be of small consequence and Preiss has returned to duty. He is now serving as junior on the Lampasas.

A. Schweider has succeeded H. Orben as junior on the Kroonland.

C. A. Werker is now senior on the Maracaibo. A. E. Hapeman, formerly attached to the Maracaibo, has been assigned to the Ponce of the Gulf Division.

A. J. Costigan has been assigned to the steam yacht Sultana, which has been newly equipped.

J. Rodenbach has taken the place of Joseph Wright on the Larimer.

N. J. Kearney of the Havana has been appointed senior on the American liner New York to succeed William J. Brookes, who has resigned.

D. Cawman and H. A. Pendleton have been assigned as first and second, respectively, to the El Dia.

W. Miller is now on the El Sud.

H. Hodder is now junior on the Madison.

P. Grasser is now on the Llama. W. Tylar has been transferred to the Devonian, an English Marconi Company vessel, for temporary duty.

C. S. Gould is now on the Gulfoil.

G. F. Hawkins has been detailed to the Santa Rosalia. He succeeded J. A. Jackson, who has been transferred to the City of Hankow.

J. Lohman is now attached to the Santa Cruz.

W. Blackstone is at present attached to the El Norte.

H. E. Orben and J. Feingersh have been assigned as first and second, respectively, to the El Rio.

Alfred De Silva is now second on the Coamo.

H. E. Cohen, late of the C. S. Relay, is now attached to the North Star.

H. Sanders has been assigned as assistant to the Guantanamo. William Dillon is senior.

Friends of Don Surrency will regret to learn that he has met with an accident and is a patient in a hspital at Savannah. Surrency was senior on the City of St. Louis.

Great Lakes Division

Marconi Inspector L. C. Dent, accompanied by United States Government Inspector J. F. Dillon, recently completed a trip of inspection to the various stations on Lake Michigan.

E. I. Deighan has been assigned to the Ashtabula station, relieving H. C. Rodd, who takes the S. S. Octorara as senior. J. H. Coolidge has been assigned to the Octorara as junior.

The S. S. Eastern States has been transferred from the Detroit and Buffalo to the Detroit and Cleveland Division of the D. & C. Navigation Co. G. S. Mackwiz, who was senior on the Eastern States, was transferred to the City of Detroit III. F. Marshall, who was junior on the Eastern States, has resigned from the service. William Read has been assigned to go on the City of Detroit III.

D. A. Nichols is with us again, having been assigned to the second trick at the Mackinac Island station.

V. Burgbacher, on the s. s. City of Cleveland III, has resigned from the service. William Brede takes his place.

C. Bendtsen is now on the Harvester, a one-man ship.

The Lakeland was recently placed on the passenger schedule, running from Port Huron, Mich., to Duluth, Minn. F. Stehmeyer and C. G. Fuss were assigned to her as senior and junior, respectively.

F. C. Goulding, who recently returned from the Gulf Division, has been placed in charge of the Juniata.

C. K. Little is now first on the North American.

R. Wright recently returned from the Eastern Division, who has been doing temporary relief work on ships and at stations in the Cleveland District, has been detailed to the s. s. State of Ohio.

B. B. Minium has been assigned to the South American as senior.

R. Sidnell and Grostick have been assigned to the Seeandbee as senior and junior, respectively.

G. Aldridge is now first on the Northland, vice E. H. Striegel, who resigned from the service. E. Leonard has been assigned to the Northland as junior.

Grand Marais station was closed July 1st. Manager Hagen, of the Cleveland station, was assigned to the s. s. Lakeland as senior, vice F. Stehmeyer, who is leaving the service.

E. M. Tellefson is now on the large passenger carrying whaleback Christopher Columbus.

S. K. Culbertson is once more in the fold, having recently joined the S. S. Missouri as senior.

The following transfers and assignments have been made recently in the Lake Michigan District:

W. C. Cram to the Georgia; D. P. Derry to the Arizona; H. Shotwell to the Puritan, vice S. R. Henry, who went to the Illinois; C. P. Eich to the Virginia, vice H. M. Junker, detailed to the Manitou; J. F. Weiss to the City of Grand Rapids; F. Weide to the Holland; G. Keefe to the S. Y. Lydonia; C. M. Dibbell to the Eastland; N. R. Hitchcock to the City of South Haven and M. F. Kliepera to the Minnesota.

H. P. Roberts is doing split trip work on the excursion boats running out of Cleveland.

Pacific Coast Division

E. L. Fairley has joined the Atlas.

C. H. Canfield recently joined Barge 91.

L. S. Grabow, in charge of the Bear for the last sixteen months, was on vacation from June 18th to July 3rd.

D. R. Clemons has been detailed on the Colusa as operator in charge.

H. Grundell, acting as relief operator for the East San Pedro District, has been permanently assigned to the Cabrillo for the summer season.

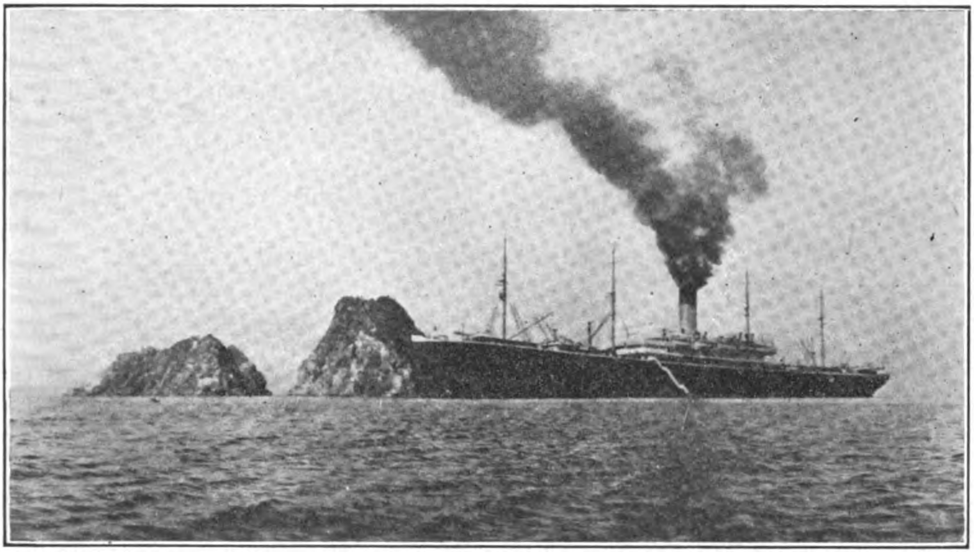
Puebla, left on a vacation trip June 24th.

R. Savage joined the Enterprise as assistant on July 3rd.

J. E. Echlin, formerly of the Construction Department, is now in charge of the Grace Dollar.

H. G. Austin and F. W. Brown are aboard the Governor as first and assistant, respectively.

P. S. Finnell and C. T. Nichols are serving on the Great Northern as first and assistant, respectively.



The steamship Minnesota on a reef at the entrance to the Inland Sea of Japan. Charles F. Trevatt, operator in charge, forwarded an interesting account of his experiences in getting a response to his S O S. This was published in the July issue. Eight divers blasted the reef for nineteen days before the boat was freed

P. Flaig has been assigned as assistant on the Columbia.

S. Rudonett has joined the Celilo as first operator.

W. R. Lindsay has rejoined the Colon.

H. C. Hax has been temporarily assigned as operator in charge of the City of Topeka, with F. L. Comins as assistant.

B. R. Jones and E. V. Baldwin have been assigned to the City of Para as first and assistant, respectively.

A. F. Lange and A. E. Evans are acting as first and assistant of the City of Puebla.

R. F. Harvey, second on the City of

V. H. Rand recently relieved W. S. Scott as assistant operator on the Honolulan at New York.

P. E. White has been assigned as assistant on the F. A. Kilburn.

J. E. Johnson has been assigned to the Mongolia as assistant.

A. Konigstein and F. A. Lafftery have been detailed on Matsonia as first and assistant, respectively.

E. J. DesRosier was recently detailed as assistant on the Manoa.

L. E. Grogan was recently granted a short furlough.

T. Lambert recently joined the F. A. Moffett.

A. Seidl recently joined the Nann

Smith as asistant.

A. Pattison is now in charge of the Norwood.

F. W. Harper has been temporarily assigned in charge of the Northern Pacific.

J. F. McQuaid has joined the Oregon for service in Mexican waters.

N. McGovern is now in charge of the Governor.

J. H. Southard is acting first of the Queen.

S. A. Hodges has been assigned as assistant on the Roanoke.

E. T. Jorgensen recently joined the Hillcrest station staff.

H. Hatton, formerly in charge of the Governor, has been transferred to the Siberia as assistant.

R. W. Baer is now acting assistant on the San Jose.

O. C. Belding has joined the Speedwell as assistant.

J. C. Mitchell has been assigned as operator in charge of the San Ramon.

C. E. Goodwin recently relieved D. W. Kennedy as assistant on the Santa Clara. Kennedy is leaving for a short vacation.

George Jensen recently relieved operator J. M. Foy on the Henry T. Scott.

O. Treadway has relieved J. H. Gaud as operator in charge of the William Chatham.

S. Cissenfeld recently joined the Wilhelmina as assistant operator.

J. W. Morrow has rejoined the Wapama as operator in charge.

L. Fassett has been detailed in charge of the Yosemite.

Seattle Staff Changes

M. A. Obradovic was recently transferred from the Pavlof to the City of Seattle and later assigned as second operator of the Senator.

A. C. Burntswiller of the Senator is now first on the City of Seattle.

A. P. Neilson, second on the City of Seattle, is now in charge of the Alliance.

R. F. Harvey, first on the City of Seattle, was recently transferred as second on the City of Puebla. He proceeded to San Francisco, where he will spend a short vacation.

C. E. Capwell, a new man, is second on the City of Seattle.

J. M. Chapel, second operator on the Humboldt, has been promoted to first operator on the Admiral Evans.

A. Lang of the Admiral Evans is now first on the City of Puebla.

G. B. Ferguson of the tanker Mills is second on the Umatilla, where he is filling in temporarily pending an opportunity to return East.

F. M. Ryan has re-entered the service and is now first on the Umatilla.

E. Lee has been appointed to the tanker Mills.

B. C. Springer, second on the Spokane, who has been ashore on sick leave, is now on the Humboldt.

A. E. Wolfe recently spent a vacation on a ranch which he has acquired. W. B. Wilson, late of Friday Harbor, relieved Wolfe during the latter's absence.

MARCONI PANEL SET TEST

The United States Department of Commerce recently arranged for a test of the latest Marconi ½ k. w. panel set, together with a set of 100 Edison batteries of 80-ampere hour capacity on the Steamship Howard of the Merchants & Miners Transportation Company. Previous tests indicated that the 40-ampere hour battery was not of sufficient capacity to meet the requirements of the radio act. The battery and wireless outfit were installed on the Howard at Baltimore on July 5th. The following persons planned to witness the test: Frederick A. Kolster and R. Y. Cadmus, representing the Depart of Commerce; Mr. Smith of the Edison Battery Company; T. M. Stevens of the Marconi Company, and Charles J. Pannill, representing the Merchants & Miners Line and the Naval Radio service.

A dispatch from Gloucester, Mass., says that John Hays Hammond, Jr., who for several years has been conducting experiments in wireless telegraphy is to set up a manufacturing plant and experimental station on Fisher's Island, Long Island Sound.

ANOTHER SIDE OF AN OLD STORY

A new version of the circumstances under which Stephen S. Sczpanck, wireless operator on Car Ferry No. 18, lost his life on Lake Michigan, September 9, 1910, has been given by one of this magazine's readers. Inspired by the account of the mishap published in the June issue, and what were considered some discrepancies contained therein, the letter introduces the subject thus:

"The writer at the time of this disaster, was employed as an operator in one of the Great Lakes stations, and although I was not on duty at the time of the sinking, I received first hand information within a short time thereafter from the operators who were responsible for all that was done in the matter of rescue.

"To begin with the Marquette Car ferries do not carry loaded passenger trains. They are equipped with four tracks running through the ship, with a capacity of thirty-two cars, eight on each track. The only cars carried normally, are cars of freight between the Pere Marquette terminal at Ludington and the Chicago and Northwestern, or Chicago, Milwaukee and St. Paul railroads at Manitowoc and Milwaukee. The shipping of cars, loaded across the lake, on steamers at this point, saves the time and expense of the long haul around Lake Michigan. There are several other car ferry systems similar to the Pere Marquette system, but in no case except at Mackinaw and the Detroit River are passenger cars loaded aboard the ferries. Like the Pere Marquette ferries, most of the other ships of this class which make cross-lake runs are fitted with stateroom accommodations for a comparatively large number of passengers. At the time of the sinking of the 18, only a few passengers were carried.

"In reference to the accident itself, the cause of it has never been definitely determined. The night watch on one of his rounds found two feet of water in the after hold, below the car dock, which was the first evidence that anything out of the ordinary was wrong. After it was found that the vessel was taking water faster than the pumps would remove it, several of the loaded cars were shot out over the stern of the ship. This is generally supposed to have been the immediate cause of the rapid settling of the after end of the ship, as it undoubtedly caused the remaining cars to be torn loose from brakes and caused the final plunge, carrying the ship down within a very few minutes.

"The distress signal was sent out at soon as the operator could be aroused (the operator on these ships is also the purser and his only chance for rest is during the trip across the lake). Night Operator Durffe, at Ludington, I think was the first operator to hear these distress signals. Later other stations picked them up. The only intelligible message that was received was 'Number 18 sinking in mid-lake.' All efforts to get more definite information were without avail. Tugs were immediately dispatched from various points around the lake, but a rescue of the greater portion of the crew and passengers was affected by the steamer Pere Marquette 17, which was bound from Milwaukee to Ludington. It is said that she loomed up through the haze that hung over the lake just in time to see the 18, with her bows high in the air, take the final plunge. So rapid was the sinking that the deck forward was blown out, due to the compression of the air under it.

"A strange part of this disaster, if the rumor be true, is that the only piece of wreckage that was found was the Type D tuner which floated ashore on the Wisconsin coast. This was picked up by someone and was displayed in a window in Manitowoc.

"Trusting that this information may be of some interest to your readers, I am

"Yours very truly,
"M. E Packman,
"Dept. of Radio Telegraphy."

It is announced that inland distribution of weather forecasts by wireless is the latest weather bureau experiment. Messages will be transmitted at a speed slow enough to accommodate amateur wireless operators.

Herbert L. Winn, who had served as a wireless operator in the U. S. Navy for a number of years, died recently in Cedar Rapids, Ia. He was twenty-six years old.

Queries Answered

Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of an individual can be answered. To receive attention these rules must be rigidly observed.

Positively no Questions Answered by Mail

Ans.—Secretary of the Talo Club:

The phase displacement of the current and voltage in an alternating current circuit becomes zero when the frequency

$$N = \frac{1}{2 \pi \sqrt{L C}}$$

where L and C are respectively the inductance and capacity of the circuit. Likewise, the energy in the secondary circuit of two coupled circuits is at maximum when the circuits have the same frequency, n, that is to say, when the two circuits are in resonance, or from the previous equation where $L_1, C_1 = L_2, C_2$, where the subscripts 1 and 2 refer respectively to the primary and secondary circuit constants. This should settle your argument relative to phase displacement in an aerial and the actions taking place when wireless telegraph receiving circuits are brought into resonance. You are quite correct in believing that enameled wire for a given size has greater distributed capacity than double covered wire, the effect in such a circuit being that of a small condenser connected in shunt to the coil.

Do not forget to take into consideration that when the condenser capacity in series with the receiving aerial is decreased and the inductance correspondingly increased that the decrement of damping is decreased and the circuit may therefore become more selective.

* * *

A. B. Lorain, Ohio, inquires:

Ques.—(1) What causes an aerial to be directional?

Ans.—(1) The following explanation is adapted from Fleming: If a rectangular closed oscillator has its current at a certain instant flowing in the direction of the arrows, as in Fig. 1, its field will consist of concentric closed lines of magnetic force perpendicular to the paper, towards the reader in the area of the loop and away from the reader in the outside space. Now place an open oscillator, DF, whose length is the same as CE, near to it, and whose current is the same as CE but in the opposite direction. The magnetic fields due to DF consist of concentric rings about DF. This causes a weakening of the external field on the right hand side of the loop and a strengthening of the external field on the left hand side of the loop. Now bring the open oscillator in connection with CE. This is equivalent to Fig 2, since the current in the right hand side of the loop will neutralize. Therefore the effect of an inverted L antenna is to strengthen the field on the side away from the horizontal member and consequently to cause a strengthened signal to be received from that side.

Ques.—(2) Is a slanting aerial as good for sending as for receiving?

Ans.—(2) Yes.

Ques.—(3) Does a rotary spark gap put as much current in the aerial circuit at high speeds as when running at slow speeds?

Ans.—(3) It depends upon the design of the rotary gap and the constants of the set. Speaking generally of amateur apparatus, however, when the rotary disc is operated at high speed the current flowing in the antenna circuit will decrease.

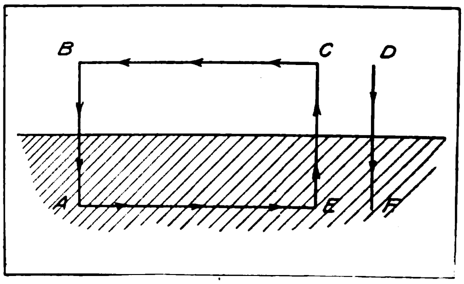


Fig. 1

J. A. R., Milwaukee, Wis.:

Ans.—The new government station at Darien, Isthmus of Panama, is in daily communication with Arlington, Va., and Point Loma, Cal. It is fitted with a 100 k.w. arc set and operates at present on a wave-length of 10,000 meters. The call letters are NBA. The signals from this station are only audible on a "tikker" type of receiver or special vacuum valve detector circuits. The station may be heard working with Arlington between 9 and 9:30 P. M. and at 1 A. M. eastern standard time.

The station at Sayville, L. I., sends nightly on a wave-length of 8,000 meters. Tests are made with Nauen on the undamped oscillation apparatus (Joly system), but the pre-

liminary experiments have not been wholly successful. The new towers at the Sayville station have just been completed.

The Marconi stations at San Francisco, Cal., and Honolulu, Hawaiian Islands, are in daily communication and give highly satisfactory commercial service.

The wave-length of the Marconi station at Glace Bay, Nova Scotia, is 8,000 meters; the spark frequency is about 600 per second.

The New Brunswick station of the Marconi Company is not open and will probably not be in operation until the corresponding stations in England are released from the control of the British Admiralty.

The Marconi high power station in Carnarvon, Wales, is in daily communication with the corresponding high power station in Petrograd, Russia.

* * *

J. B. N., St. Louis, Mo., inquires:

Ques.—(1) I often hear that certain ship installations are fitted with arc transmitters and are thus able to transmit and receive with vessels employing the spark system. How is this accomplished? I have always been under the impression that arc sets are inaudible on the ordinary type of receiving apparatus.

Ans.—(1) To our knowledge only a very few vessels are fitted with arc installations. To establish communication with other stations employing the crystalline receivers, a device known as a "chopper" is employed to interrupt some portion of the oscillatory circuit at a certain rate per second of time. Audible pulses are thus produced, but the resultant note is not clear and rather unsuitable for rapid transmission. Arc sets used in this manner are not efficient and may be considered as a temporary makeshift.

Ques.—(2) Do arc sets operate more successfully at wave-lengths of 3,000 or 4,000 meters than on the shorter wave-lengths?

Ans.—(2) Yes.

Ques.—(3) If so, would this be considered as a hindrance to their general adoption?

Ans.—(3) Yes, as long as other ship installations or land stations are fitted with the spark type of apparatus.

* * *

R. A. L., Chicago, Ill., asks:

Ques.—(1) Can the induction coils advertised in THE WIRELESS AGE and offered to the amateur field be used in connection with an oscillation transformer and a condenser? If so, what range of wave-lengths can be covered?

Ans.—(1) Yes. The potential of these coils is such that they operate most efficiently with a condenser capacity of .002 microfarad. If a sufficient number of turns are added at the primary winding of the oscillation transformer, wave lengths up to 800 meters may be obtained.

Ques.—(2) Is the spark note produced by these coils clear and well pitched?

Ans.—(2) The note produced is superior to that given by the average mechanical or magnetic interruptor.

Ques.—(3) What wave-lengths may be adjusted to with the type D tuner?

Ans.—(3) If a "looped" aerial is employed wave-lengths up to 2,000 meters may be reached. If the left hand tuning coil of this tuner is used as a loading coil for the right hand tuning coil, wave-lengths between 5,000 and 6,000 meters may be obtained.

Ques.—(4) Are assignments ever made from the operating service of the Marconi Company to the other departments, such as the Traffic or Engineering divisions?

Ans.—(4) Practically the entire force of assistants in these departments has been recruited from the marine service.

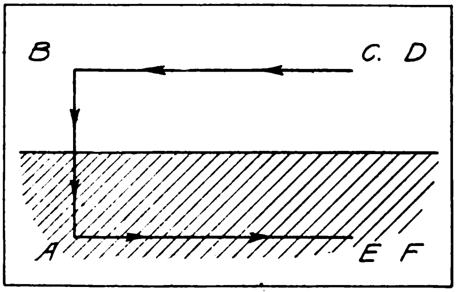


Fig. 2

S. F. M., Mercer, Pa., inquires:

Ques.—Will you please give me the name and address of the author of the First Prize Article on page 691 of the June issue of THE WIRELESS AGE? I have tried to make a detector similar to the one he described, but failed to get results and therefore wish to consult him.

Ans.—William O. Tait, Rossmore avenue, Bronxville, New York.

* * *

A. T. H., Northeastham, Mass., inquires:

Ques.—(1) Please tell me the wave-length of an aerial, consisting of three wires, 150 feet in length. The aerial is 40 feet in height at one end and 24 feet in height at the other. The lead-in, taken from the lower end, is 15 feet in length. The ground wire is 20 feet in length.

Ans.—(1) The natural wave-length of this aerial is about 330 meters.

Ques.—(2) What diameter and length of both the primary and secondary tubes are necessary for an inductively-coupled receiving tuner having a wave-length adjustment up to 4,000 meters? How many contact points should be used on this coupler to obtain the best results?

Ans.—(2) The secondary winding of the receiving tuner should be 9¾ inches in length by 3 inches in diameter, wound closely with No. 26 S. S. C. wire; or, if desired, the length of the coil may be slightly decreased and wound with No. 30 S. S. C. wire. The secondary winding should be shunted by a small

variable condenser, such as the Clapp-Eastham type, having a capacity of .001 microfarad. The turns of this winding should be equally divided between the taps of a twelve point switch.

The dimensions of the primary winding will vary with the size of the aerial with which it is to be employed. But in the particular case cited it may be 3½ inches in diameter, 9 inches in length, wound closely with No. 24 wire. A suitable switch for the primary winding of this receiving tuner is described in the First Prize Article published in this issue.

Ques.—(3) Will the aerial described in my first question be of sufficient length when used with a loading coil 3¼ inches in diameter by 8½ inches in length, wound full of No. 24 B. & S. enamel wire, to adjust the aerial system to wave-lengths between 4,000 and 5,000 meters, with efficient results? It should be understood that a 4,000-meter loose coupler is to be used in connection with a fixed condenser and galena detector.

Ans.—(3) If it is intended to use a loading coil of this description, the primary winding for the tuner previously suggested may be considerably reduced in length, say, to one-half its value. In that case wave-lengths up to 4,500 meters may be received.

* * *

B. A. B., Louisville, Ky., inquires:

Ques.—Please give me the wave-lengths and call letters of some of the high power wireless telegraph stations within, say, 4,000 miles of the United States.

Ans.—A list follows:

Locations of Stations.	*Call Letters.*	*Approximate Wave-Lengths.*
Glace Bay, Nova Scotia	WSS	8,000 meters
Newcastle, Province of N. B., Canada	VAN	8,200 meters
New Brunswick, New Jersey, U. S. A.	WII	8,000 to 15,000 meters
(Arlington) Radio, Virginia	NAA	Spark set... 2,500, 3,500 meters Arc set... 7,000 meters
Darien, Isthmus of Panama	NBA	15,000, 10,000 meters
So. San Francisco, Cal	KSS	6,000 to 8,500 meters
Bolinas, Cal.	KET	7,000 meters
Kahuku, Hawaiian Islands	KIE	5,000, 12,000 meters
Heeia Point, Hawaii Islands	KHX	9,000 11,000 meters
Point Loma, San Diego, Cal	NPL	5,500, 6,000 meters
Eilvese, Hanover, Germany	OUI	8,100 meters
Nauen, Germany	POZ	9,400, 8,000 meters
Carnarvon, Wales, England	MUU	6,500 meters
Clifden, Ireland	MFT	6,000 meters

C. R. P., Saginaw, Mich., inquires:

Ques.—(1) Can you calculate the wave-length of my aerial from the following data: It is 95 feet in height at one end and 85 feet at the opposite end, the total length being 105 feet. It is made up of four No. 22 B. & S. gauged phosphor bronze wires, spaced 7 feet 4 inches apart; the lead-in being brought down from the lower end and composed of four No. 22 copper wires twisted together. The total length of the lead-in is about 135 feet. My calculations indicate that the natural wave-length of this aerial is about 279 meters. Am I correct?

Ans.—(1) The natural wave-length of the aerial described is about 380 meters.

Ques.—(2) Where can I obtain complete data for the construction of a 2 k.w. 500-cycle generator?

Ans.—(2) This question is beyond the scope of the Queries Answered department. We suggest that you communicate with some prominent manufacturing concern. You may obtain from the latter, at considerable expense, the necessary data.

* * *

C. U., Marion, Ohio, asks:

Ques.—(1) Please tell me whether I should be able to receive signals from Glace Bay, Nova Scotia, with the following receiving outfit: My receiving tuner has a primary winding, 4¼ inches in diameter by 4¾ inches in length, wound full with No. 24 enamelled wire. The secondary winding is 3½ inches in diameter by 4¼ inches in length, wound full with No. 30 S. S. C. wire. I have two loading coils in the primary circuit, one 3¾ by 16 inches in length, wound with No. 24 enamelled wire, the other 6 inches in diameter, 23 inches in length, wound with No. 22 D. C. C. wire. I also use a loading coil in the secondary circuit; it is 4 inches in diameter by 10 inches in length, wound full with No. 36 S. S. C. wire, the entire secondary winding being shunted by a condenser of .001 microfarad capacity. I employ ferron and galena for the receiving detector; also a 2,000-ohm head telephone set which is shunted by a fixed condenser of .0165 microfarad. The receiving aerial consists of two wires, 325 feet in length by 35 feet in height, the wires being spaced 2 feet apart. The lead-in consists of one No. 4 copper wire, 80 feet in length.

Ans.—(1) It is extremely difficult to receive the signals of the Glace Bay station inland, except with the most sensitive types of receiving apparatus. It is very doubtful, indeed, whether you will receive the signals from this station. The inductively coupled receiving transformer described will not allow a sufficient degree of coupling for the maximum strength of signals. Furthermore, the loading coil wound with No. 36 wire has entirely too much resistance for efficient results.

This core should be wound with No. 30 or 32 S. S. C. wire.

We do not recommend the use of a condenser in shunt to the head telephones having a capacity of .0165 microfarad. A condenser having capacity of .003 microfarad is quite sufficient. In the February, 1915, issue of The Wireless Age, the secondary winding for a receiving tuner, capable of receiving wave-lengths up to 11,000 meters, is fully described. The primary winding will, of course, vary with the size of the aerial.

Ques.—(2) Are there any regular working hours for the Glace Bay station?

Ans.—(2) This station is in continuous communication with a corresponding station in Clifden, Ireland, giving a 24-hour service.

Ques.—(3) Have you any information concerning the opening of the New Brunswick station and its working hours?

Ans.—(3) See the answer to the inquiry of J. A. R. in this issue.

We suggest that you redesign your receiving tuner, as per article in the February issue of The Wireless Age.

Your query in reference to Sayville is fully answered in the response to the question of J. A. R. in this issue.

* * *

A. B. R., Alton, Ill., inquires:

Ques.—(1) Will a stranded wire aerial give better results for receiving than a solid wire?

Ans.—(1) This can only be determined by a comparison of the conductivity afforded by the two types of wire. Stranded wire has a slightly lower value of high frequency resistance, but, on the other hand, equal surface conductivity will be afforded by a solid conductor of increased dimensions. From an amateur standpoint, it makes little difference whether stranded or solid wire is used, provided the solid wire is at least as large as No. 18.

Ques.—(2) Does an aerial give better results when the wire is new than when it is old and dirty?

Ans.—(2) It is possible that with certain types of wire, other than copper, a coating of rust or other formation may possess a partial degree of conductivity and, in the effort to travel on the surface of the wire, the high frequency oscillations may encounter some resistance. With the copper wire ordinarily employed in aerial systems, the matter need not be taken into account.

Ques.—(3) Does the Glace Bay station use a sustained wave?

Ans.—(3) Strictly speaking, no, but the oscillations have very feeble damping.

Ques.—(4) I have had considerable trouble with my vacuum valve detector, which seems to act in a peculiar manner. I can copy vessels all along the Atlantic Coast with ease. I get WHB, WSE and many other coast stations very clearly. I often hear signals from Cape Hatteras (WHA) so loud that I can copy them with the receivers several inches from my head. But Arlington, Key West, Sayville and even a 10 k.w. station at Springfield, Ill., sixty-seven miles away, can hardly be heard. If I switch from the vacuum valve detector to a silicon detector, the order of things is completely reversed and the larger stations come in clear and strong. Please advise me regarding my difficulties?

Ans.—(4) Lacking complete data concerning your receiving tuner, we advise as follows: It is very likely that, in order to adjust to the longer wave-lengths, you employ a variable condenser in shunt to the secondary winding of the receiving transformer and, therefore, require a considerable value of capacity for resonance. In the case of the vacuum valve detector, which depends upon potential for its operation, considerable energy is diverted to the condenser itself and, therefore, the signals are weak. On the other hand, when you employ a silicon detector, the condenser in shunt to the secondary winding does not have such disastrous effects, probably because the silicon detector requires less potential and, in consequence, the signals are received with considerable strength. The difficulty can be eliminated in the following manner: The secondary winding of the receiving tuner should be rewound with finer wire or the present wire winding extended so that wave-lengths of the higher power stations can be adjusted with an exceedingly small value of capacity in shunt to the secondary winding; say not more than .0001 microfarad. If this change is made you will find that the signals from the higher power stations will be heard with increased strength when the vacuum valve is employed.

* * *

L. J. E., Gloversville, N. Y., inquires:

Ques.—(1) Please describe a receiving set that will receive undamped waves?

Ans.—(1) Secure a copy of United States patent No. 1,113,149. The complete circuits of a supersensitive receiving set of this type are fully described. Also observe the drawing (Fig. 2) appearing in the Queries Answered department of the September, 1914, issue of The Wireless Age. The circuits for a sliding wire type of receiving tikker are fully shown in that issue.

Ques.—(2) Is a set of this type necessary to receive signals across the ocean?

Ans.—(2) Yes, if you desire to receive signals from stations employing undamped oscillations.

Ques.—(3) Where can vacuum valve detectors be purchased?

Ans.—(3) Communicate with the Cost and Sales Department of the Marconi Company, 233 Broadway, New York City.

Ques.—(4) Please tell me where I can purchase a book on vacuum valve detectors and the necessary diagrams of connections?

Ans.—(4) No publications have been issued on this subject but the forthcoming issue of the proceedings of the Institute of Radio Engineers will show a number of schematic diagrams applicable to the valve.

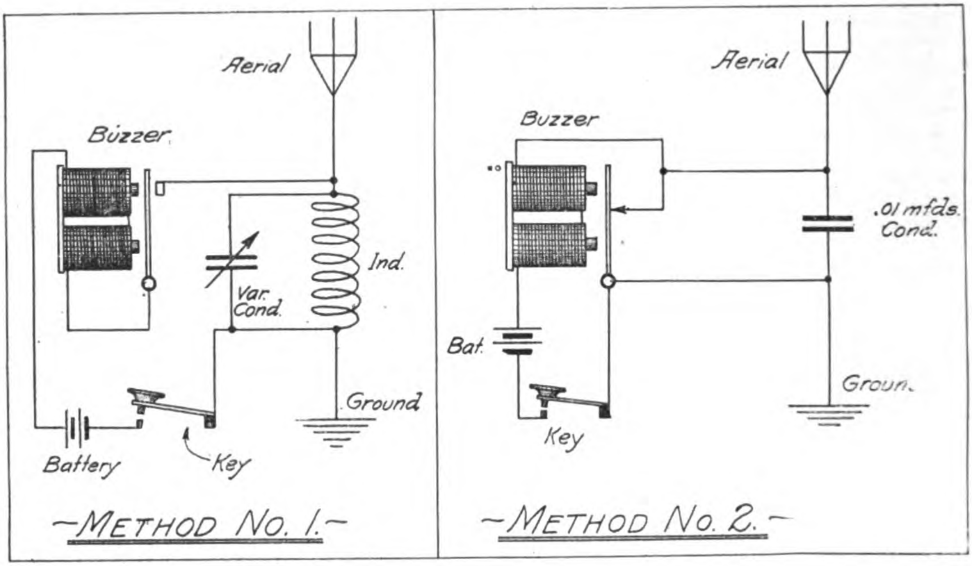


Fig. 3

A. S., Brooklyn, N. Y.:

Ques.—(1) Give a diagram of connections for a transmitting buzzer set capable of transmitting about two miles.

Ans.—(1) A complete diagram of connections is given in the accompanying drawing (Fig. 3).

Ques.—(2) Does a spark coil have to be used in this set?

Ans.—(2) No.

Ques.—(3) Please tell whether I will be able to hear the signals from Sayville on 4,800 meters with the following apparatus: The aerial has a natural wave-length of 190 meters and the receiving-tuner has a single winding, 9 9/16 inches in length by 3¼ inches diameter, with two sliders. I have four condensers of 3, 4, 8 and 11 plates covered with tinfoil 2½ inches by 1½ inches, separated by wax paper. The condensers are variable from the detector side as shown in the enclosed diagram of connections. The system of connections employed is that shown by S. C. Beckley in the March, 1915, issue of The Wireless Age. The coil is covered with No. 28 wire.

Ans.—(3) A loading coil in the antenna circuit is required. It should be about 8 inches in length by 3 inches in diameter, wound closely with No. 24 wire.

* * *

C. B. C., Superior, Wis., inquires:

Ques.—(1) Please state the natural wave-length and capacity of my aerial which is 140 feet in length and 25 feet in height. It has four No. 14 copper wires 18 inches apart. The lead-in, which is at one end, comprises two wires of the same size, 75 feet in length.

Ans.—(1) The natural wave-length of this antenna is about 310 meters; the capacity is about .0005 microfarad.

It is difficult to calculate the capacity of the antenna described in your second query, but roughly speaking, we should say it is about .00055 microfarad, and the natural wave-length about 400 meters.

Ques.—(3) Do you think I would be troubled by induction from alternating current power lines 80 feet away if the aerial was 25 feet above them?

Ans.—(3) If the antenna wires lay parallel to the power wires, severe induction noises will be experienced. If the antenna is placed at right angles to the power line the effects may be minimized, depending, of course, upon other local features.

Ques.—(4) Will my sending range be considerably reduced by these wires?

Ans.—(4) Somewhat; particularly if the antenna wires lay parallel to the power wires.

* * *

E. M. T., East Orange, N. J., writes:

Ques.—(1) Can I obtain satisfactory time signals from Arlington using an indoor aerial 36 feet in height by 23 feet in length, with crystalline detectors?

Ans.—(1) It is very doubtful, indeed, whether you will be able to receive these signals. The aerial should be at least 60 or 70 feet in length. In a wooden building it makes little difference whether the aerial is indoors or out of doors, provided the necessary dimensions are obtained.

Ques.—(2) What would be the first and second choice of crystals?

Ans.—(2) Cerusite and galena are preferable.

Ques.—(3) Please give the dimensions for a tuning coil and other apparatus applicable to the reception of time signals?

Ans.—(3) The primary winding of the receiving tuner should be 3½ inches in length by 3½ inches in diameter, wound fully with No. 26 S. S. C. wire. The secondary winding may be 3¼ inches in diameter by 3½ inches in length, wound fully with No. 28 S. S. C. wire. The secondary winding as described is intended to be used with a .001 microfarad variable condenser in shunt. The secondary winding may have a 10-point multiple point switch while the primary winding should have a sliding contact or multiple-point switch, such as described in the First Prize Article in this issue.

* * *

B. S., Davenport, Ia., writes:

Ques.—(1) Please publish the call letters and power of amateurs holding special licenses in District No. 9:

Ans.—(1)

Locations.	*Call Letters.*	*Owners.*
Ames, Ia	9YI	Iowa State College of Agriculture and Mechanics' Art.
Beloit, Wis	9XB	Beloit College.
Grand Forks, N. D	9YN	University of North Dakota.
St. Louis, Mo	9YC	Christian Brothers' College.

Ques.—(2) I have had trouble with the contacts on a 2-inch spark coil and cannot get anything but a ragged tone. Is a mechanical converter practical? If not, what would you advise? I am using a 30-volt storage battery unit as the source of current.

Ans.—(2) The average magnetic interrupter is not apt to give a high spark note except with certain types furnished with small spark coils which often give a fairly constant note, but will not remain in that adjustment for an indefinite period. Mechanical converters are practical for the smaller coils up to the size you suggest, but beyond that power considerable arcing is apt to be experienced. The electrolytic interrupter will give a very high spark note of considerable smoothness and if you have a 110-volt source of supply, we advise the use of this type.

Ques.—(3) Would a hot wire ammeter help in tuning the aerial circuit when using a 2-inch coil?

Ans.—(3) If the spark gap of this coil is connected directly in series with the antenna, it would be of no value except to indicate the actual amount of current flowing. An ammeter for this purpose should have a maximum range of not more than one ampere; in other words it should be a milliampere meter having a range of from about 100 milliamperes to 1,000 milliamperes. If you employ an inductively-coupled oscillation transformer, a hot wire ammeter is of considerable value for indicating when the two circuits are in exact resonance.

Ques.—(4) Should the secondary terminals of a transformer be connected across the spark gap or across the glass plate condenser?

Ans.—(4) Either connection may be employed. If the secondary winding is connected to the terminals of the spark gap, the coils of the secondary are protected to some extent from the high frequency surges of the condenser, but as far as general efficiency is concerned, equal results will be obtained with either connection.

Ques.—(5) What companies have wireless telegraph exhibits at the San Francisco Exposition?

Ans.—(5) The United States Navy and the DeForest Radio Telegraph & Telephone Co.

* * *

A. L., Winsted, Conn., writes:

Ques.—(1) I have a vacuum valve detector with which I am not able to get as good results as with the perikon detector. In the high voltage battery circuit I employ ten everready flashlight cells connected in series, the potential being adjusted by means of a three-point switch. For lighting the filament I use four red seal dry cells regulated by a rheostat. The complete equipment is wired up as per the drawing. The only stations that I can hear are Arlington and Sayville, the signals of which do not come in any louder than when I use a perikon detector. I can hear South Wellfleet on my perikon, but cannot hear them at all on the valve. Is my apparatus connected up correctly or what would you suggest to eliminate the trouble? If it is connected up wrong, will you please give a diagram of the proper connection?

Ans.—(1) A diagram of connections is unnecessary. The variable condenser which you have connected in series with the filament of the valve should be connected in series with the circuit to the grid. You have no variable connection in the antenna circuit and consequently it is adjustable to one wave-length only. One slider of your 2-slide tuning coil should be connected to the antenna system and the other slider connected to the variable condenser which is in series with the grid. A connection should be taken from the filament of the valve to the earth lead of the tuning coil. The high and low voltage battery circuits are connected up properly. When the changes suggested have been made you should have no difficulty in reading the signals from Cape Cod, provided your aerial is not of abnormal wave-length. We advise an eight or ten-point switch in the high voltage battery of the valve so that closer regulation of potential may be obtained.

Ans.—(2) Your second query is fully answered in the answer to J. A. R. in this issue.

Ques.—(3) I have a Packard high potential transformer which gives 13,500 volts in the secondary. It is of the closed core type. How many glass plates, 7 by 10 inches, are required to make a condenser for said trans-

former? The remainder of the transmitting apparatus comprises an oscillation transformer which has 7 turns of heavy brass strip in the primary winding and 13 turns of brass strip in the secondary winding. Also a rotary spark gap having eight points on a 5-inch disc; speed, 3,000 revolutions per minute. The aerial is 85 feet in length, consisting of 4 antenna wires, spaced 6 feet apart. One end of the aerial is 35 feet in length and the other end 30 feet. The lead-in is 20 feet and the ground wire about 25 feet.

Ans.—(2) The natural wave-length of the antenna system is about 200 meters and when the secondary winding of the oscillation transformer is connected in series it will be raised to a value above that number. Therefore, to comply with the amateur law, you require a short wave condenser of about 0.0004 microfarad connected in series.

A condenser suited for this transformer should have a maximum capacity of .009 microfarad. Fifteen plates of glass of the size given, covered with foil, 5 by 8 inches (all plates connected in parallel) will give a capacity of .009 microfarad. With this capacity no more than two turns at the primary winding of the oscillation transformer are required.

Ans.—(4) The query concerning the Darien station is fully answered in the answer to the question of J. A. R. in this issue.

Ques.—(5) I use a Murdock two-slide tuning coil with my vacuum valve. Would an inductively-coupled receiving tuner give better results? Why is it that I cannot hear stations other than Arlington and Sayville?

Ans.—(5) The two-slide tuners will give satisfactory results and if you make the changes suggested in our answer to your first question you should have no difficulty in receiving the signals from stations of shorter wave-lengths.

* * *

E. J. M., Lewiston, Me., writes:

Ques.—(1) One evening last February I heard CN (Carnarvon) and GB (Glace Bay) exchanging signals and, strange to say, they were received on 600 meters. The signals received were practically all figures, containing but few letters. Do you think it is possible to hear CN on 600 meters? I am positive that is what they signed. I verified the message I received with a certain amateur the next day.

Ans.—(1) The signals which you received are not from the Marconi high power stations but have their source on board certain Admiralty cruisers and battleships near New York harbor, in fact CN is the former White Star liner Caronia, which has been near New York for some time.

Ques.—(2) What is the wave-length of my aerial, which is 60 feet in length and has four wires spaced 2½ feet apart? The height is 70 feet, while the lead-in is 35 feet in length. It is of the inverted L type.

Ans.—(2) The natural wave-length of this antenna is about 225 meters.

Ques.—(3) I have two 20-foot pipes to support the antenna and two guy wires on each pipe with insulators. Will the pipes interfere with my receiving work? I painted them with tar.

Ans.—(3) The pipes will practically have no effect on your receiving work.

Ques.—(4) Is it more difficult to get a position with the Marconi Company if the course in wireless telegraphy given by the Radio Institute of Boston is taken, instead of the course at the Marconi School in New York?

Ans.—(4) If you wish to be employed in the Eastern Division of the Marconi Company it will be necessary for you to take a finishing course at the Marconi School in New York City.

Ques.—(5) Please tell me the sending range of my transmitting set with the antenna as described, the high potential transformer having capacity of ¼ k.w. and the spark gap being of the stationary type. The oscillation transformer is 9 inches in diameter and has 3 turns in the primary, and 12 turns in the secondary of No. 4 copper wire spaced ½ inch apart. I use a glass plate condenser, 8 by 10 inches, 1/16 of an inch thick. Has the condenser the right capacity?

Ans.—(5) If this condenser comprises a single plate only its capacity is not sufficient for the work. If the transformer is fitted with a condenser of the proper capacity—about .009 microfarad—you should be able to cover a distance of about twenty-five or thirty miles, depending, of course, upon the type of receiving apparatus used at the receiving station.

* * *

R. W., Portsmouth, Ohio, writes:

Ques.—(1) I have under construction a receiving transformer for special purposes. It is of the enclosed primary type. The primary winding is 9½ inches in length by 5 inches in diameter, covered with No. 31 enameled wire. The secondary winding is 9½ inches in length by 4⅝ inches in diameter, wound with No. 40 enameled wire. If this transformer will give efficient results, I should like to know what range of wave-lengths it can be adjusted to on a moderate sized aerial.

Ans.—(1) This transformer will be found wholly inefficient at any wave length. The secondary winding should be covered with No. 30 or 32 S. S. C. wire and the primary winding with No. 26 or No. 28 S. S. C. wire. It is advisable not to use enameled wire on account of its distributed capacity. The present windings will give a wave-length adjustment of between 8,000 and 12,000 meters.

Ques.—(2) Are the connections for the primary circuit, given in the enclosed drawing, correct?

Ans.—(3) The method shown may be used, but care must be taken that the secondary winding is placed in inductive relation to the used turns of the primary winding; otherwise no signals will be received. If wired up exactly as shown in your drawing, the unused turns of the primary winding will overlap

the secondary winding by several inches. Observe the First Prize Article in this issue, which contains a description of a unique switch for varying the inductance of the primary circuit. The article in the series on "How to Conduct a Radio Club" in the February, 1915, issue of THE WIRELESS AGE will aid you in designing an efficient receiving transformer.

* * *

M. R. S., Pennsburg, Pa., inquires:

Ques.—(1) How can the power factor of a transformer be determined and of what importance is it? Please give the power factor for the ½ k.w. Packard transformer.

Ans.—(1) The power factor of an alternating current is the percentage measurement of the angle of lag between the current and voltage in that circuit. The power factor equals the ration of R over Z, where R equals the ohmic resistance of the circuit and Z equals the impedance. If the power factor of an alternating current circuit is definitely known, also the apparent voltage and current readings, then the actual watts of that circuit may be calculated from the following formula:

$$W = E \times I \times \cos\Phi$$

where W equals the power in watts.
E equals voltage of the circuit.
I equals current flowing.
$\cos\Phi$ equals power factor or ratio of R over Z.

If you are in possession of voltmeter, ammeter and wattmeter, the power factor of an alternating current circuit can be quickly determined. When these three instruments are properly connected in the circuit to be measured, simultaneous readings of the watts, as given by the watt meter, and the apparent volts and amperes, as given by the volt and ammeter, are taken. The apparent watts can be obtained by multiplying the apparent current by the apparent voltage; the actual watts by the wattmeter. The ratio of the actual watts to the apparent watts is the power factor of that circuit.

We cannot give you the power factor of the Packard transformer, because we have no data as to its construction, resistance, impedance value, etc.

Ques.—(2) I have a small $3 Murdock vertical plate condenser. Please give me dimensions for an inductance suitable to this condenser to make a wave-meter which will adjust to 500 meters; also a table to translate the readings on the condenser into wave-lengths. I saw a description of a similar wave-meter, given in one of the series of articles on "How to Conduct a Radio Club," but it did not cover a condenser of this capacity.

Ans.—(2) We are not familiar with the capacity of this condenser nor have we any data regarding it.

Ques.—(3) In which direction is an inverted L type of aerial most effective?

Ans.—(3) In the direction opposite to the free end.

Ques.—(4) How can the wave-lengths of the inverted L and T aerials be determined? Give formula.

Ans.—(4) See article in the Electrician by Cohen, February, '13.

Ques.—(5) Please give a formula for determining the proper capacity for a sending condenser. How can the inductance value of an oscillation transformer be determined?

Ans.—(5) The following formula is applicable to a sending condenser:

$$C = \frac{K\ A\ 2248}{T \times 10^{10}}$$

where C = the capacity in microfarads.
A = the area of the dielectric in use.
T = the thickness of the dielectric in inches.
K = the dielectric constants which ordinarily vary from 6 to 9.

The inductance of an oscillation transformer may be measured by the process given in an article of the series on "How to Conduct a Radio Club" in the September, 1914, issue of THE WIRELESS AGE. This measurement requires a calibrated wave-meter. Please note the article appearing in this issue on the calculation of inductance.

* * *

S. L., Scranton, Pa., inquires:

Ques.—(1) What is the wave-length of my aerial? It consists of four strands of No. 14 aluminum wire, 104 feet in length, arranged on 6-foot spreaders. It has four lead-in wires, 20 feet in length, and the entire aerial is spaced 30 feet above the earth.

Ans.—(1) The natural wave-length of your antenna is about 250 meters.

Ques.—(2) I have an R. J. four-vacuum valve detector in my station. It works very well at all wave-lengths up to 1,000 meters, but I am unable to hear stations sending above this wave, although I can hear them distinctly on a crystal detector. I am enclosing a drawing of the connections I use as I have found that my set will not work with any of the standard connections. Can you tell me how the signals from the other stations may be received?

Ans.—(2) We have made a careful examination of your drawing and cannot understand why it is necessary to employ this method of connection. If your receiving tuner had the proper values of inductance in both the primary and secondary windings you should be able to use any of the standard diagrams of connections. Note the article in the series on "How to Conduct a Radio Club" in the January, 1914, issue of THE WIRELESS AGE. The circuits and the constants for receiving tuners of various dimensions are fully covered. We suggest that you connect a variable condenser of very small capacity in series with the grid of your vacuum valve detector. Signals are received with greater strength on your crystal detector because the secondary winding is more suitable for this particular type of detector, but if you will give the secondary winding increased dimensions so that for a given wave-length the ca-

pacity of the variable condenser in shunt is at a minimum value you will secure increased results. There are a number of first-class amateurs in your vicinity who are perfectly familiar with vacuum valve detectors and no doubt will be able to help you.

* * *

J. A. K., S. S. Winifred:

We are not familiar with the details of the Jackson System and do not know whether it includes anything out of the ordinary.

The Armstrong circuits are given in U. S. Patent 1,113,149.

The description of the phenomenon in your third query is too long for publication, but it should be understood that, when placing the finger on one side of the crystal detector results in increased strength of signals, it is due to the added capacity of your body which gives a fineness of adjustment that the variable elements of the apparatus do not afford.

The intermediate circuit of the Marconi valve tuner should give very sharp tuning. If it does not do so, there is some error in the circuits that needs correction.

Increasing the spark electrodes on the Marconi non-synchronous discharger from 6 to 10 does not result in any loss in current, but will probably give increased results on account of the higher spark pitch produced. Since the telephones are more sensitive to spark frequencies of between 600 and 800, increased strength of signals may be obtained.

* * *

E. W. M., Berkeley, Cal., asks:

Ques.—(1) Is any advantage derived in using a rotary spark gap on a small spark coil fitted with a magnetic interrupter?

Ans.—(1) No.

Ques.—(2) How far should I be able to send with a ½ k.w. Clapp-Eastham hytone set at a wave-length of 200 meters?

Ans.—(2) About 25 miles.

Ques.—(3) How can I figure out the primary voltage of a spark coil?

Ans.—(3) Try to obtain this information from the makers of the coil.

Ques.—(4) What are the dimensions for a two-inch spark coil and how should it be made?

Ans.—(4) The primary winding should consist of two layers of No. 14 S.C.C. wire wound on an iron core 1¼ inches in diameter by 10½ inches in length. The primary winding should then be covered with several layers of Empire cloth or a hard rubber insulating tube about ⅛ of an inch thick. The secondary winding should comprise four sections of No. 34 B. & S. S.C.C. wire and the total length of the winding should be about 7 inches. Two and one-half pounds of wire are required. The primary winding may be fitted with a magnetic interrupter like that supplied with the ordinary spark coils. The design of a satisfactory interrupter is described in "Wireless Telegraph Construction for Amateurs," by Alfred P. Morgan.

B. G., Newark, N. J., inquires:

Ques.—(1) I am about to erect a new aerial and I want it to be of the most efficient type. The aerial will have a span of 80 feet length and a height of 55 feet. The aerial leads will be 25 feet in length and the ground connection about 18 feet in length. I use seven-strand No. 20 phosphor bronze wire with the necessary insulation and 15 feet 6-inch spreaders. Please give me the number of strands and the length of the horizontal and vertical portion for transmission and receiving purposes on 200 meters? Should it be of the inverted L or T type?

Ans.—(2) The aerial as described has a natural wave-length of about 235 meters, which is too long to comply with the United States regulations. An amateur's aerial for transmitting purposes should have a natural wave-length of not more than 165 meters. When the secondary winding of the oscillation transformer is connected in series the wave-length will be raised to 200 meters. An aerial having a natural period of 165 meters may consist of four wires 50 feet in length by 40 feet in height, spaced 2 feet apart. Such an aerial will have a capacity of about .002 microfarad.

Ques.—(2) Could I employ a Clapp-Eastham ½ k.w. hytone set at its full input with this aerial, or am I limited to a ¼ k.w. rotary gap?

Ans.—(2) The Clapp-Eastham hytone set may be used at full ½ k.w. input on 200 meters.

Ques.—(3) Is a series condenser and a large aerial more desirable when the receiving range is taken into consideration?

Ans.—(3) As far as receiving is concerned we answer in the affirmative, but if the aerial is also to be used for transmitting, the use of a series condenser is not advisable. Amateur aerials have not been found efficient when the wave-length is reduced by means of a series condenser, and we, therefore, advise that its natural wave-length be not more than 200 meters under any conditions. If it is desired to receive the wave-lengths of higher power stations we recommend the use of two aerials, one having the dimensions described for transmission on a wave-length of 200 meters, and the second one which may have a natural wave-length of from 600 to 800 meters, for receiving from stations employing the longer wave-lengths.

Amateurs have informed us that they have secured better results in transmitting by means of the series condenser and an antenna of increased proportions, but our experiments have not borne out the assertion.

* * *

G. A. W., Lynn, Mass.:

The aerial described in your first query has a natural wave-length of 255 meters and a capacity of about .00392 microfarad.

The receiving apparatus described in your second query should give a day range of about 200 miles and a night range of 800 miles.

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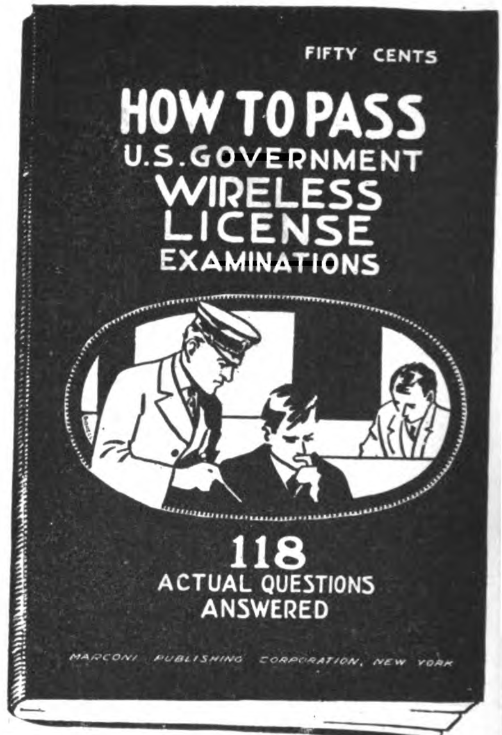

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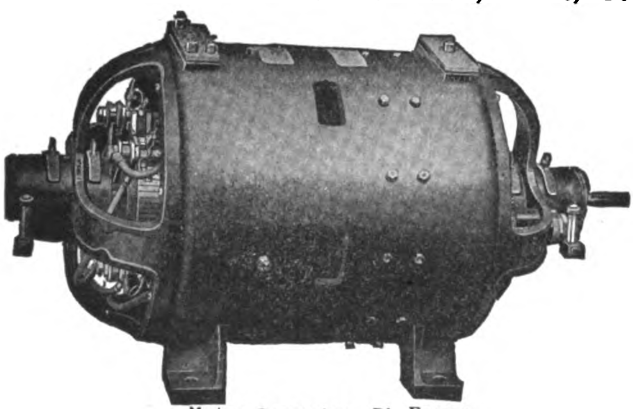
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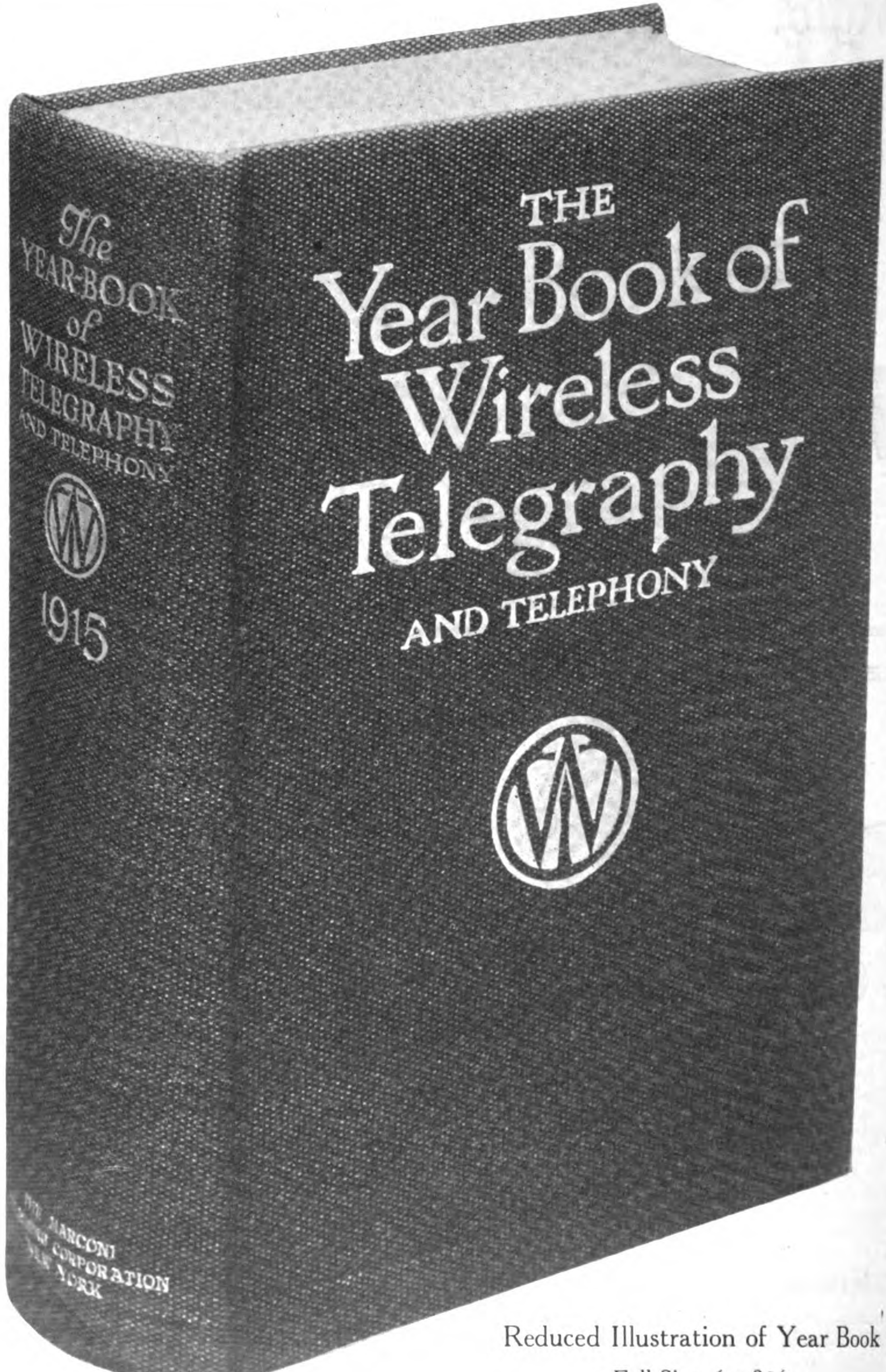

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